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BRIEFLY TOLD.

TWO PAPERS READ AT THE LAST MEETING OF THE PACIFIC COAST GAS ASSOCIATION.—The technical portion of the proceedings of the last, or Sixth Annual Meeting of the Pacific Coast Gas Association, as so far shown in our official publication of that which was said at the sessions, was most creditable to the Coast gas men. The papers read were many, their subjects were timely and valuable, and their treatment was effective. And the most potent evidence that the members were interested in the set matter brought before them lies in the fact that brisk discussions, bristling with individuality, followed the reading of the papers. Take, for instance, the paper by Mr. J. L. Howard, of San Francisco (it appears in this issue), who wrote on the topic of "Coal Combustion and Smoke Prevention." It is needless to say that Mr. Howard wrote intelligently, for much of his business life has been devoted to the handling of coals in a commercial way, and it is equally satisfactory to note that his presentation contains not a word which smacks of the shop or the yard. His well put together sentences need no attempt at elucidation here, for they tell their story simply and effectively. One point, however, which he makes in connection with smoke prevention should be well pondered over, and that point seems to be contained in the second last paragraph of his paper, where he points out that "The most perfect form of fuel is that in the gaseous condition; next in order is the liquid petroleum, when atomized and mixed with its proper proportion of air in the presence of a high temperature." Naturally enough, the "perfect" form of fuel, so far as a smokeless stack top is concerned, is of either kind named by Mr. Howard; but in general practice neither form will generally prevail in ordinary factory working, unless their cost quite closely approaches the cost of other solid fuels of any description. In connection with this matter our English correspondent, in his budget to us for this month, notes that "A water company in London has been proceeded against and fined for an emission of black smoke from the chimneys of a pumping station, and if this course was taken in every instance there would be thousands of such cases to report, which suggests the reflection as to whether the abatement of the smoke nuisance, concerning which so much has been claimed in London and elsewhere, has really gone much further than the substitution of anthracite for bituminous coal, not a very marked advance. Smokeless fuel is rather a different thing from the prevention of smoke, and a great deal more seems to turn upon the price or the supply of anthracite than is generally supposed. One comfort is, that if anthracite fails, coke and gas are always at hand. And if, as recent experience gives strong reasons for believing, the secret of successful smoke abatement is really smokeless fuel, the outcome will be an increased demand for these agents." There we have it. The discussion on Mr. Howard's paper took on a wide way, and not the least interesting part of it was that made in the dialogue between Mr. Jones and Mr. Guldlin respecting the relative values, weight for weight, of anthracite coal and "gas house" coke for use in water gas generators. We have no doubt that sharply defined sides will be taken in this controversy hereafter; but on first blush it looks to us that Mr. Guldlin had the better of the argument. From whatever standpoint one views or examines the Howard paper and the discussion that it provoked, the only conclusion that

can be reached is that both were valuable and that each will bear close study. Another paper that attracted much attention was by Mr. William M. Parker, who wrote in response to the question "Should Gas Companies Do All Gasfitting?" Its text will be found elsewhere in the JOURNAL of to-day. This subject has been before the gas men for many a year, and its solution is far from having been arrived at. The tendency, however, is undoubtedly towards an affirmative answer, which tendency has been made all the more marked by the great strides taken in the placing of gas cooking and heating appliances, and the favor which has been accorded to the prepayment meter. Of course, it is a large proposition that gas companies should do all gasfitting, but the clear cut fact of to-day is that the companies (in small places as well as large) are getting closer all the time towards monopolizing the gasfitting done in their localities. And the plan seems to have commonsense on its side, for the company is really at least equally concerned in the premises as the consumer, whereas the interest of the gasfitting trade ends in the particular "job" when the money for it has been paid over. Although Mr. Parker's paper is exceptionally lengthy, we are quite sure that its length rather adds to than detracts from its merit, and that is saying much in commendation thereof.

NOTES.—We have from the William M. Crane Company a notification that their offices and showrooms have been removed to Nos. 1131 and 1133 Broadway, corner 29th street, which spacious, comfortable and beautiful housing will enable them to show their specialties pertaining to the use of gas to the best possible advantage. They also inform us that their facilities for manufacturing have been largely augmented through the acquiring of a well equipped foundry at Peekskill, N. Y. ——Mr. S. F. Hayward, the irrepressible head of the Connelly Iron Sponge and Governor Company, has again appeared in the literary field. This time his talent has been devoted to an exposition of the virtues of "The Hayward Automatic Gas Governor," and the result is the appearance of a well put together, smartly illustrated and fetching catalogue, the illuminated cover of which bears the exclamatory question, "Gas Tips! Have you Money to Burn?" Write to him for a copy.——We take pleasure in announcing that Mr. Thomas Newbigging's "Handbook for Gas Engineers and Managers"—sixth and centenary edition, illustrated, from the press of Mr. Walter King, London—is ready for sale. We hope to make a suitable review of it next week. ——At a convention of the "acetylene gas manufacturers of America," held in Chicago something over a fortnight ago, a permanent organization was effected. The officers chosen were; President, George Landis Wilson, of the F. C. Wilson Company, Chicago; Vice-President, J. W. Earl, of the National Sunlight Gas Company, Minneapolis; Secretary, J. B. Carroll, of the Modica-Carroll Company, Chicago; Treasurer, C. D. Moody, of the Moody & Moffutt Company, Louisville. It is understood that the Association will make a determined effort to "obtain better countenance for the acetylene product from the insurance interests of America than at present obtains."——At the annual meeting of the Butte (Mont.) Gas Light and Coke Company the only changes in the Directorate were the elections of Messrs. R. S. Feurtado and J. R. Thompson, who replace Messrs. A. W. von Utasy and W. H. Hopper. It was virtually decided to make a considerable concession in the gas rates, the schedule to be announced later. The Company enjoyed a prosperous year.——A correspondent at Los Angeles, Cal., forwards the following: "Dr. W. G. Leutz, of Phœnix, Ariz., who is at a local hotel, came to Los Angeles to get a needed rest, but for a time it looked as if he were not going to get the latter. Friends had sent him the following telegram: 'You forgot to turn off lights in office; still burning; wire instructions.' The Doctor hied him to a telegraph office and instructed: 'Turn off lights quick. Assistant has key. If not, see electric company and cut wires.' The reply was to the effect that the assistant was in the country and the company was perfectly satisfied to make up for its loss occasioned by the exodus from Phœnix, and refused to cut the wires. In his desperation the Doctor wired: 'Break the door and smash the lamps and disconnect the wires. Do anything to stop the light. The bill for it will be enormous.'" Our correspondent adds: "The lights are out."——Mr. R. G. Rolston, for many years President of the Farmers Loan and Trust Company, died at his home in Babylon, L. I., on the morning of the 25th inst. In April, 1897, while on his way to his home, he was stricken with paralysis, the shock being so severe that he never recovered from it. He was a Director in the Consolidated Gas Company for several years, his interest therein having been acquired under the advice of the late Mr. Moses Taylor, through earlier investments in the old Manhattan Gas Company. Mr. Rolston was in his 66th year, and was very prominent in all financial undertakings in which Mr. Samuel Sloan is concerned. His immediate survivors are his widow, a daughter and two sons.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—Continued from Page 270.]

SIXTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD AT SAN FRANCISCO, CAL., JULY 19 AND 20, 1898.

SECOND DAY, JULY 20, MORNING SESSION.

The Association reconvened pursuant to adjournment. The President introduced Mr. J. L. Howard, of San Francisco, Cal., who read the following paper, entitled

COAL COMBUSTION AND SMOKE PREVENTION.

The problem of the prevention and abatement of smoke in the combustion of coal has long occupied the attention of chemists, mechanics and inventors. For public and economic reasons the solution of this problem has been attempted in a variety of ways, and with varying measures of success. During recent years, however, the subject has assumed new importance as a public question in many Eastern cities, where smokeless fuels hitherto used in manufactories have been displaced by those that produce smoke, and the demand for a remedy has arisen from the owners of buildings that are threatened with soot discoloration and from the public officials having regard for the appearance and health of their cities.

It may serve a good purpose if we take a brief and hasty survey of the character and composition of fuels, of the wonderful chemical operations that take place in the process of combustion, of the elements that are involved in it and of the conditions that favor its completeness.

In commercial fuels we have examples of the three states of matter:

Solid: As in coal and wood, where the force of attraction binds together the molecules.

Gaseous: As in artificial or natural gas, where the repellent force separates the molecules.

Liquid: As in petroleum, where the two forces act in equilibrium.

These different forms of carbon, or of combinations with it, constitute the supply from which is obtained the material to produce light and heat.

In the consideration of coals it will be found that there are two commercial divisions:

1. The anthracites, which are distinguished chemically by the presence of much fixed carbon and of but little volatile matter. They vary in quality within narrow limits, and are practically smokeless.

2. The bituminous, which grade into the anthracite condition, and are made to comprehend all below that down to the lower order of lignites.

Therefore, these have a larger range of quality. They have in less degree what anthracites have in abundance, viz., fixed or non-volatile carbon, and they have a high percentage of volatile matter which is very low in anthracites. It is this difference which makes the general distinction between the anthracite and bituminous grades.

Let us look for a moment into the method employed to determine the constituents of coal and their quantitative relations. A pulverized sample is accurately weighed and subjected to a heat of 212° F. until the weight becomes constant. The loss or the difference between this and the original weight indicates the amount of *moisture* that has been expelled. The crucible is then covered and the heat is greatly increased until the weight again becomes constant. The loss, or the difference between this and the preceding weight, indicates the amount of *volatile matter* that has been driven off; the balance is coke. When this has been burned a reweighing will indicate the amount of *fixed carbon* that has been consumed, as well as the remaining incombustible matter or *ash*.

This method of proximate analysis is the determination of contents by weight differences, giving the moisture, ash, fixed carbon and a chemically complex body called volatile matter, consisting chiefly of hydrogen and carbon in combination, oxygen and sulphur. It is this wonderful complex body that has special interest in this discussion.

We are now able to understand the cause for the great variations of quality in coals, due to the differences in the proportions of constituent parts, as may be more clearly shown by the following table of analyses of a few typical coals:

	Bituminous.		Anthracite.	
	Lignite, Seattle.	Australian.	Pennsylvania.	Welsh.
Moisture	7.	2.52	2.50	.96
Volatile matter	31.75	30.57	2.224	5.82
Fixed carbon	58.25	61.05	90.276	90.63
Ash	3.	5.86	5.	2.59
	100.	100.	100.	100.

For the interest that it may have, I quote from "Wagner's Approximated Tables," showing the chemical alteration that has taken place in the progress from the lower to the higher forms of fuel :

	Carbon.	Hydrogen.	Oxygen.
Wood	52.65	5.25	42.10
Peat	60.44	5.96	33.60
Lignite	66.96	5.27	27.76
Bituminous	76.18	5.64	18.07
Semi-anthracite	90.50	5.05	4.40
Anthracite	92.85	3.96	3.19

While this table shows the total of the fixed and the free carbon, yet it indicates that in this progress there has been a constant decrease in the volatile matters until the highest condition is reached in the anthracite stage. We may now leave this preliminary survey of fuel composition, bearing well in mind that the elements concerned in combustion are : First, in anthracites, the fixed or non-volatile carbon, which ranges from 85 to 90 per cent. of the mass ; second, in bituminous, the fixed carbon and also the hydrocarbons contained in the volatile matter, remembering also that moisture, oxygen and ash are not concerned in it, and that the intrinsic value of the fuel is affected in the proportion that they exist.

We come now to consider the question of combustion, which is due to the chemical combination of atmospheric oxygen with the combustible elements contained in the fuel.

Chemistry has determined that 29.86 cubic feet of oxygen per pound of carbon, or two volumes of oxygen to one of carbon, are needed to produce carbonic acid gas, resulting from the *complete* combustion of carbon ; that 89.6 cubic feet of oxygen per pound of hydrogen, or one volume of oxygen to two of hydrogen are needed to produce water, resulting from the *complete* combustion of hydrogen ; and that 11.2 cubic feet of oxygen per pound of sulphur, or two volumes of oxygen to one of sulphur, are needed to produce sulphuric acid, resulting from the *complete* combustion of sulphur.

This relation of oxygen to combustibles is fixed and definite. If less be furnished the combustion will be partial ; if an excess be furnished the combustibles will appropriate what they need and the detrimental surplus will pass away. Atmospheric air contains about 21 per cent. of oxygen.

Knowing this, and knowing also the chemical composition of any fuel, it will be seen that the amount of air needed for its combustion is calculable.

For example, a coal containing 90 per cent. carbon, 5 per cent. hydrogen, 3.5 per cent. oxygen, 1 per cent. nitrogen and .5 per cent. sulphur, would require 143.98 cubic feet of air per pound, or 322,515 cubic feet of air per ton, of coal.

It follows, therefore, that, unless sufficient air carrying oxygen shall be brought into contact with the carbon and hydrogen to produce carbonic acid gas and water, the combustion will be incomplete and there will be a loss of heat energy.

Let us follow in part the chemical and physical changes that occur in the consumption of bituminous coal. When a charge of fresh coal is thrown on the fire the first effect is to lower the temperature of the furnace, because of the cold air that is drawn in through the open fire door, and because new coal at the atmospheric temperature (say 60° F.) is fed upon a bed of coals, the temperature of which may vary from dull, red heat (say 1,300° F.) to bright, white heat (say 2,500° F.). The sudden reduction of furnace temperature is not conducive to chemical union at this critical point.

The distillation of volatile matter begins almost at once, and it has been found that, at a temperature of about 1,100° F., most of the coal gases will ignite if the oxygen be present.

When the distillation process is completed, then the operation in the fire is the combustion of the fixed carbon, which is combined with the incombustible matter in the coke. The oxygen rushes to the carbon as it is exposed on the surface of the incandescent lumps and continues the attack until they are reduced to ashes. The product now is either carbon monoxide or carbon dioxide, according to the completeness of the process. It will be noticed that heat is essential and that the combustion will be intensified as the supply of oxygen is increased.

This burning of bituminous coke after the volatile products are driven off is the same operation that consumes anthracite coal and artificial coke. It is the combustion of the fixed carbon, and the products are not visible.

Smoke may be called the *visible* part of the products of combustion. We have seen that it does not occur in the burning of anthracite nor in the consumption of the coke portion of a bituminous fire. We are, therefore, able to say that it is generated during the distillation of the volatile matter contained in bituminous coal, and it is due to the imperfect combustion of those gases. The ingredients chiefly concerned are the hydrogen and carbon. It has been found that the hydrogen constitutes only 5 to 6 per cent. of the coal constituents, and that oxygen has for it a stronger affinity than it has for carbon. We, therefore, conclude that some of the volatile carbon when in the gaseous state is not consumed, but is condensed or precipitated into the solid condition of soot, and we may further assume that this change from the gaseous to the solid condition will result from any of three causes : First, an insufficient supply of oxygen to consume the volatilized carbon of the coal ; second, a want of thorough contact between that and the oxygen ; third, unfavoring temperature conditions for the quick and complete combination of the oxygen and the volatile carbon.

It is upon these lines that inventors have worked to produce devices looking to the prevention of smoke.

It must be remembered that the *commercial* loss in the production of smoke itself, great as it may at times appear to the eye, is really unimportant, for experiment has shown that bituminous coal burned under very unfavorable conditions yielded in soot only about one-half of 1 per cent. of the weight of the coal tested, and an analysis of the soot shows the actual loss to be immaterial. Far greater losses may be suffered in products that are not visible, for if the carbon be turned into carbon monoxide a heating power measured by 4,500 British thermal units per pound of carbon is obtained ; whereas, if the process be not arrested, and this gas, by the addition of one atom of oxygen, can be converted into carbonic acid gas, the resultant heat will be 14,500 British thermal units, or more than threefold.

The difference between the positions of the steam and gas men is, therefore, readily seen. In water gas making the struggle is for carbon monoxide, that erstwhile nightmare of our local journals, while in steam making the effort is to push the process on to carbon dioxide, a product which to the gas man is worse than useless. Again, in coal gas making, the method of destructive distillation employed is different only in so far as that air is excluded. The gas man finally burns his hydrocarbon through a jet under proper heat and where the supply of supporting oxygen is abundant for perfect combustion of the gas, but the steam man finds it difficult to maintain the needed constant furnace temperature and to regulate the supply of air to meet the varying calls for oxygen during the process of volatilization.

The cry for relief has brought forth anti-smoke ordinances in such cities as Chicago, Cincinnati, Cleveland, Pittsburg, St. Louis, Detroit, Milwaukee and Minneapolis, and like measures are under consideration in other cities. There seems to be only a half-hearted enforcement of such laws ; in fact, the Chicago ordinance remained passive until an association of citizens took steps to compel an observance. History shows that London, which has suffered more than any other city of the world, sought legal relief 600 years ago, when the use of bituminous coal was made a capital offence. There have been spasms of legislation since that time, and still she suffers. The situation is greatly aggravated there, because of the hundreds of thousands of household chimneys that are contributing to pollute the atmosphere, and the domestic hearths are not as amenable to treatment as are the boiler furnaces of manufactories.

While the use of anthracite coal is spreading in England it will take much time to divert the trade from the long used bituminous coals, as indeed it would be difficult to turn the household demand of the Atlantic seaboard from the anthracite.

The anti-smoke legislation in this country has had the effect, however, of greatly increasing the number and kind of devices intended to remedy or palliate the evil.

We have the principle of compelling the volatile gases to come in contact with the high temperature of incandescent coal, as is rudely attempted in the hand firing of the two sides of a furnace alternately, or by overfiring and drawing the gases down through a bed of live coals on an underlying grate, as was shown by James Watt, and more recently developed in the Hawley furnace ; or by the use of dead plates in the front of the furnace, whereby the gases from the fresh coal would pass over the incandescent matter in the rear ; or by pistons which push a body of coal from a front hopper into the furnace ; or by underfeeding arrangements, where the fresh coals are automatically fed from an underlying trough and gradually pushed into the furnace, meantime the evolved gases being made to pass through the overlying bed of incandescent coals.

There have been numberless methods of introducing air with and without steam : Through vertical perforated plates situated under the bridge wall, through split bridge walls, from the furnace sides in jets from above the furnace doors, through furnace doors, hot air, cold air

and saturated air, above and below the fire, are all represented in the patents. The schemes seem to have culminated in what are called automatic stokers, of somewhat complicated and expensive mechanism, intended at one stroke to cover the entire range of involved problems.

First, by a mechanical transport of the coal from the bins to furnace hoppers, and an arrangement of feeding on slow moving grates of different types, to reduce the number and cost of attendants connected with coal firing and ash removal; second, to keep an even and high furnace temperature by avoiding the opening of fire doors and the chilling effect of a body of fresh coal when scattered over the fire; third, to admit air in such way and in such quantity as to bring about complete combustion of all the combustible elements in the fuel.

The published experience of those who have used these elaborate systems is not *all* favorable to them.

The law does not seem to be effective, and the steam user maintains a nuisance because he may. He does not know that, while smoke is a visible sign of *some* waste, it is strong presumptive evidence of a greater loss not visible, and he has not been convinced that a comparatively inexpensive and effective method can be used, without material alteration to his existing plant, that will prevent the formation of smoke and make available a greater heat energy from the fuel. He has little if any interest in the chemical or physical arguments or reasons for a change. The proof that he wants is to see a smokeless stack and lower fuel bills at a reasonable cost for the installation to produce these results.

I may close my paper with the relation of some personal experiences.

The effort to introduce Welsh anthracite smokeless coal as a steam fuel compelled us in some instances to guarantee economy, based upon its evaporative power and its cost as compared with grades of bituminous coal. This brought such knowledge from the tabulation of comparative steam making values that we finally did not hesitate to guarantee that Welsh anthracite, when burned under our system, would evaporate 25 per cent. more water than the best grade of Australian steam coal. We never failed in such an undertaking, because with our method the anthracite, with adjusted grate area and air space and with forced draught, was burned under more favorable conditions than was the case with bituminous coal burned under the conventional methods.

This becomes the more apparent when you observe that the total of the heat giving constituents of a good bituminous coal and of an ordinary anthracite are nearly the same, and self-interest prompted a line of experiments to prove whether a bettering of the conditions would not make the combustion of the bituminous coals more complete, and thereby not only prevent the formation of smoke but also secure the greater advantage of increasing its value by raising it nearer to the standard of evaporative power possessed by the anthracite coal.

After a somewhat careful study of the bituminous coals that come to our market, of their action in the furnace and of the principles that underlie the classes of patents that have been offered, some experiments led us to observe that beyond the quantity of air and the temperature of the furnace, lay an important factor, namely, the method and the place of administering the air to bring about a thorough contact and union of the oxygen and the combustible elements of the fuel.

It may be stated that, in order to prevent any reduction in furnace temperature through the opening of fire doors, an automatic or other mechanical contrivance is necessary for the feeding of the coal and for the removal of the ashes.

There are comparatively few of the total number of owners of steam plants who recognize the ultimate value of these arrangements looking to economy, or who have the inclination to risk the investment of money in modern appliances. It, therefore, becomes necessary in this field of study to devise a simple, effective and not expensive apparatus that may be attached to boiler plants as they exist without material changes in them.

It may be a matter of surprise to some when I state that, in the experiments to establish the ratios of air to be delivered through the grates and above the fire, the improvement in the evaporative power of the coal continued until we had delivered 2½ times as much air above the fire as was permitted to pass through the bars from below.

This verified the theory that the proper administration of air had an important bearing upon the combustion of the fuel; for, as compared with the evaporative results obtained from burning the same coal with natural draught on the ordinary bars and under the best conditions, the effectiveness was raised from 15 to 20 per cent.; and, more than this, there was an absence of smoke and only a slight color when a highly bituminous coal was mixed with coal tar.

It will need further and severe testing under all conceivable conditions and with different grades of coal for final proof that the device merits the expectation of its projectors, but it is a long move towards the end for which experimenters have been reaching out and are now working with renewed activity and with greater hope of success.

The most perfect form of fuel is that in the gaseous condition; next in order is the liquid petroleum, when atomized and mixed with its proper proportion of air in the presence of a high temperature.

The highest evaporative power will be obtained from solid fuel when it is pulverized and introduced in the furnace properly admixed with air so that the combustion will be immediate and complete. Then the greatest heat energy will be obtainable, then the smoke will naturally cease; and almost within the grasp of invention is a small, effective apparatus, attachable to the front of a boiler, into which the coal of any size may be mechanically fed, pulverized and delivered into the furnace continuously. This, too, at a cost within easy reach of the owner of steam boilers. When this is achieved there will be no need of prohibitory legislation, because the self-interest of coal users will cause the adoption of economical appliances that in their operations will obviate the smoke nuisance.

Discussion.

The President—We will be glad to hear from anyone present, either in the instance of giving additional facts, or in the line of questioning anything contained in this excellent paper by Mr. Howard. Mr. Cline, I believe, has had considerable experience in the use of petroleum for fuel. We would like to hear from him.

Mr. Cline—I have used petroleum for fuel almost exclusively during two years under the boilers in our electric lighting station. I do not believe, however, that I have anything particular to say about Mr. Howard's paper, other than to express my belief that it about exhausts the subjects on which it treats.

The Secretary—I hope that some one will speak on this subject. It seems to me the Association is particularly fortunate in having Mr. Howard a member. On the topic of coal he has for four years entertained us with papers that have compelled study on the part of those who either heard them or read them. I have received many letters commenting on Mr. Howard's papers and the research which they indicated, and the knowledge that was possessed on the Pacific Coast of the proper handling of coal, from the very start, when he advised us on Welsh anthracites, down to the present time. It seems to me all of us are interested just as much in matters affecting the electric lighting part of our business as the gas part, and this paper of Mr. Howard's comes particularly home to those who find on the debit side of the ledger every month a large amount charged up for fuel. In my case I have not had the experience in the use of Welsh anthracite coal that others have had on this side of the Bay, nor have I had any means of knowing anything particularly of the experiments which Mr. Howard has been making of late, excepting what he has told me and which he has so fully outlined in his paper; but, in common with others, I have recently been forced in the matter of economy to look for cheaper fuel, whether suggested by such means as Mr. Howard has named, or other methods, and I finally tried oil. Of course in Los Angeles Mr. Cline has been burning oil, as all other Companies have done in that part of the State, because of its cheapness in comparison with coal, which is expensive by reason of high freight rates, etc. With us until lately it has not been a factor, but the local coals act in sympathy with the foreign coals and the foreign market, and for our steam purposes we have had added to its cost gradually from time to time little bits of moneys until at last the coal reached a figure where it seemed to me that other fuels could be obtained cheaper. For the last two months I have been experimenting with Coalinga oil, using the Larkin burner. At tests made three times in the last month we have secured the best evaporation with 17.6 pounds of water weighed into the boiler for a pound of oil. At the price made for it the oil is cheaper at the present time than coal, and it has the further advantage of being a smokeless fuel. I can detect no injury at all to our boiler shells in the method of combustion employed. It maintains perfect steadiness of steam; in fact, much more so than can be obtained by any kind of coal by any other method I know of. Once your fire is started and gauge fixed at 110 pounds it will never vary even with an intermittent load. It dispenses with labor and yields a clean fire. Still there is a certain point in the price of oil at which it cannot compete with coal. The ordinary price of coal which we get on this part of the Coast precludes the use of oil for fuel, but the ruling price of coal, in conjunction with the large quantity of oil produced in the Southern part of the State, have made the use of oil possible. When the market, however, reaches its normal condition I question whether oil can compete with coal, and, especially when the ideas outlined by Mr. Howard have been carried to

completion, I question whether anyone would care to use oil as compared with coal in this section of the country. As the papers are read to evoke discussion, I hope the members will not be slow in discussing them. Do not be afraid to ask questions, because I am satisfied everybody will answer them. The papers are written not so much to be listened to when they are read—because you cannot grasp the finer points of them in the reading—as for their future reading in the published proceedings, and in that view discussions of the general points should be brought out as strongly as possible.

Mr. Jones—I wish to thank Mr. Howard personally for this valuable paper, because I realize the immense amount of work that was necessary to get together the facts. I also appreciate the conciseness with which Mr. Howard has stated propositions that are full of knots and difficult to understand in our text books. Mr. Howard has simplified them. I appreciate the two tables. I was connected with the gas business at a time when it did not make much difference whether a chimney smoked or not. Having ordinary benches of 3's, we piled in the coke, and if we happened to sell any coke after we got through we kept account of it. Of course I cannot state for the extreme early days personally, but 20 years ago little account was kept of the amount of coke used for heating retorts. In time coke increased in value to the point where we found that coke as well as coal was worth money, and that we must save and sell more of it. The result of this knowledge was the invention of the regenerative furnace, which I think, were it possible to economically apply it to boiler firing, would solve the smoke question. Of course you all understand the principle of the regenerative furnace. The term regeneration as I understand it refers to the conversion of the carbon of the fuel into carbonic oxide gas, which is a combustible gas, which, together with the nitrogen of the air, goes off as producer gas. In order to make this producer gas it is necessary to have a very deep fire, and as the early furnaces were made with upright walls, but of great depth, of course the furnaces as well as the settings of the retorts were of sufficient temperature to consume, when brought in contact with air, the carbonic oxide gas. Then the principle of recuperation came in; that is, the heating of the air for this combustion. By this system of burning fuel the smoke is entirely done away with, but it is possible, in using coke fuel, with an absolutely smokeless chimney, to waste a large proportion of the fuel fed into the fire. With a full-depth regenerative furnace it is almost impossible that any smoke should escape from the chimney, unless there be a cracked or broken retort with fresh coal in it. In that case the volatile hydrocarbons pass through the cracks, and if there is not oxygen sufficient for combustion of those hydrocarbons they pass out as smoke. To digress from the subject just a moment, Mr. Howard told me a very interesting thing some time ago which I know will interest you. The blackest smoke that issues from any of our chimneys contains only about 15 pounds of solid matter to a ton of coal placed on the grates, so that the smoke issuing from the chimney is more of a nuisance than a loss. In the use of a contrivance which would prevent smoke it would become absolutely necessary that you know the composition of the outgoing gases from the stack. You may be sending out combustible gases such as carbonic oxide, on account of choking down the amount of air fed to the furnace, or you may have converted all of the carbon to carbonic acid and the hydrogen to water and have an excess of air, which is stealing the heat from your furnace, and which takes fuel to heat up; so we have both sides of this question to consider, and it is a most serious study. In the regenerative firing of retorts it becomes absolutely necessary that the manager shall know the composition of the outgoing gases from his stack. The best practice in boiler firing is to keep the fuel in a shallow, even bed. If you go into a well-kept boiler room you do not find the boiler fireman crowding his furnaces full of fuel and then setting down on a nail keg and smoking a pipe, for he is almost constantly looking out for his fire. He is spreading his fuel in thin layers. That is all right for fixed carbon in a fuel, but in dealing with volatile matter consisting of a mixture of carbon and hydrogen (the atomic weights of carbon and hydrogen are entirely different), as you increase the amount of carbon in the mixture it becomes unstable; and really the most comfortable—if I can use that word in connection with a chemical combination—of carbon and hydrogen, is the first of the paraffine series, marsh gas, CH_4, which although well supplied with hydrogen has simply one atom of carbon. These hydrocarbons, as they pass off from the volatile matter of the coal, consist of innumerable combinations. In the heating of the furnaces there will be a tendency to break down the higher hydrocarbons, burning the fraction that is broken down and depositing lampblack or fixed carbon. The lampblack would pass off as smoke. Some time ago, in connection with Mr. Howard, we tried some experiments at the North Beach Station. He then very kindly gave me some information on this subject and I feel indebted to him for it. We attempted to take the volatile matter as it issued from the top of a bed of fuel and, by a jet of air, force it back into the incandescent fuel, thereby getting heat enough in this bed of hot carbon to consume in the presence of oxygen the volatile matter of the coal. However, it was only partially successful.

Mr. Cline—Let me ask Mr. Britton what the evaporative power of a pound of oil was?

The Secretary—The highest we obtained was 17.6 pounds of water; the lowest, 14.3, from and at 212°.

Mr. Cline—That is most extraordinary. Do you know what the weight of oil was?

The Secretary—Seven pounds to the gallon.

Mr. Cline—That is extraordinary. I never heard of anything of the kind.

The Secretary—The burner man said he never had achieved such results. That is from 212°, allowing for the steam used in the burner about 3 per cent.

Mr. Cline—That is a very deceiving element in comparison with coal and oil. With coal it is practically nil, and with oil it is large, for the reason that you have to supply the burner. Of course that is a varying factor, and depends much on the amount of steam required to feed it. Still, 17 pounds is a remarkable result.

The Secretary—They are ordinary, return tubular, 60-inch boilers, but they are in magnificent condition.

The President—You should explain that your strong point is the water you use.

The Secretary—The President thinks our strong point is the water we use. We have artesian well water, our works being located on the marsh in Oakland, and as determined by an analytical test made by Mr. Price it is on record as being the purest water in the State of California. Some of our boilers have been in operation eight years. We have 16 boilers. They never cost a cent for repairs in any way, and the boiler inspectors of the different insurance companies assure me they are the cleanest boilers and best conditioned boilers to be found on the Coast. The burner man said such excellent results were partly due to the water we used. We did not obtain those results at first, for there was some experiment as to adjustment of the furnaces. We experimented for a matter of two or three weeks in the distance that we would make the baffling wall back from the bridge wall. We made it of varying height, but finally attained the result I have mentioned.

Mr. Cline—What is the height of the baffling wall?

The Secretary—Those we have now commence even with the top of the bridge wall, and work down 4 inches each step to the firing door in 9-inch layers, one single brick.

The President—A practical test of that water in Oakland is interesting, because it is so good that I have never seen anything like it anywhere else, although I have operated boilers in all parts of the United States. I will state to you that a boiler used right straight along for making steam for water gas was not opened for three years. I found by experience it made no scale. I opened it finally out of curiosity, and the man who went in came out looking as if he had been in a flour bin. There was not a particle of scale or deposit of any kind in the boiler. All of you know the difficuly that we have with scale and dirt in the ordinary water. This boiler had been used three years, at a pressure of 110 pounds to the inch, and you could take your finger and get the color of the iron after rubbing off a slight deposit that looked like flour. The water is ideal. I have some little interest in the matter because I bored the well that produces the water. Another matter may be stated to show how different results can be. A rolling mill, which was located there on purpose to get that kind of water, by reason of employing incompetent well borers, failed to get it, but got other water so polluted that they did not get the results at all which were obtained within two blocks of them.

Mr. Fenner—I want to say a word or two about boiler fuel and combustion. An experience we had at the Potrero station was this: We bought from a Los Angeles company a set of boilers known as elephant boilers, and then I saw for the first time the use of the principle of the regenerative furnace. At the side of the boilers were little channels built in the brick walls from the front end to the back end, back and forth again, and up and down, and finally all these ended on the back of the bridge wall, coming out in some very small narrow slots to meet the fuel which came from the front end of the boiler. The opening or entrance of this channel was connected with the floor and the cold air forced through these channels was supposed to be heated up sufficiently to meet the hot gas coming from the top of the furnace. I don't know why it has not worked satisfactorily, but I believe the heat was not

sufficient to heat the air enough to heat the bench. The heat was much greater in the first place than was necessary to help the combustion of the gases which came from the front of the boiler. I have a drawing upstairs of this peculiar construction of furnace that I will be pleased to show to anyone.

Mr. Jones—Permit me to say a word at this time in connection with the paper read yesterday by Mr. Converse, and in connection with which it was my good fortune to get Mr. Howard's analysis of bituminous and anthracite coals. Yesterday Mr. Guldlin referred to the statements that I made as simply dependent upon analysis. At that time I did not care to use my own analyses, but as Mr. Howard has provided them I would like to make use of his. Mr. Guldlin stated that, pound for pound, anthracite coal and coke would give the same results when used in a generator, and I believe I said it depended in great measure upon the amount of the ash present in each fuel, because undoubtedly coke contains all the ash of the coal and the coke only represents 60 per cent. of the weight of the coal. So I calculated from Mr. Howard's figures that, on the use of 20 tons of Welsh anthracite coal a day in a generator, there will be a refuse as ash of 1,160.32 pounds, whereas the same amount of coke made from Australian coal —and I take it that means Wallsend—would give you an ash residue of 4,345.6 pounds.

Mr. Howard—This matter of Mr. Fenner's has reference only to the heating of the air before it is put into the fire, the difficulty with which system is that the air is not delivered at the proper point. You are delivering air at the bridge wall, whereas your gases are all generated in front of the bridge wall, and unless there is contact or chemical union of the oxygen of the atmosphere with the gases as they revolve those gases will pass over, and in most instances it is a little too late to try to bring the chemical combination at the bridge wall, for by that time the smoke and soot have already been formed and deposited. Unless the volatile matter which is in a gaseous condition is immediately consumed, the solid portions of it will be precipitated and condensed and go out in the form of soot and smoke. What brought my attention to this at first—and I prepared this table to show it—was the fact that the volatile matter in the coal is nearly all combustible. In this Australian sample you have nearly 92 per cent. of combustible matter. In a high grade of Welsh anthracite you have about 96 per cent. of combustible matter. The inquiry arose in my mind, "Why is it that this coal, which has only 5 per cent. more of volatile constituents than the Australian, will generate from 25 per cent. to 30 per cent. more steam?" The only conclusion we could reach was that this was burned in a fixed carbon state and under the most favorable conditions—that is, the anthracite coal; whereas bituminous coal, though it has nearly the same total of heat-giving constituents, must be burned under conditions very unfavorable for that. So we set about getting a higher steam evaporative efficiency out of this coal, to bring it up to standard which we obtained from the Welsh anthracite. For example, we got about 8.5 of water from bituminous. On one of our guaranteed contracts, we got 11.5 from Welsh. Hence you see the difference is very great, and not because of the composition of the coal but simply because the anthracite was burned under conditions more favorable to it. What I would like is that the two or three points I brought out in the paper should be carried away by the members of the Association, and the endeavor was to make the description on the basis of the combustion of steam. I hope that it was done.

Mr. Poole—I was unfortunately not early enough to hear the first part of Mr. Howard's paper. I would like to ask, under the conditions that he made those tests, whether or not he also made tests on anthracite coal, and what the relative efficiency was between that and soft coal?

Mr. Howard—Yes, we did. The fact was that with Franklin coal, by increasing the amount of air delivered above the fire to about 2½ times that was delivered below the grate, we obtained nearly as high an efficiency as we did out of the anthracite. The anthracite fell down and the Franklin went up. What surprised me more than anything else was the large increase of air. We kept on increasing the amount of air delivered over the fire constantly, until we got it up to 2½ times the area of air space that was below the fire, and up to that point the evaporative power under daily tests increased. These ran from 5 minutes up during a whole day, and at the end of the day with soft coal we did not clean the fire once, had no soot in the tubes, and raised the evaporation 15 per cent. as compared the day before with the same coal.

Mr. Martin—I would like to ask Mr. Howard if any record was kept of the stack temperatures; or, rather, if the temperatures of the gases as they left the boilers were recorded?

Mr. Howard—Yes; we kept a record of the stack temperatures.

Mr. Martin—I raised the question, because that is one of the most important features in the combustion of coal. The average fireman pays no attention to matters of that kind. There is a possibility of getting your temperatures too low for economy, but if you take the temperature of your water at the pressure at which you are operating, adding approximately 60° or 70° for the absorption of the iron or steel of which the boiler is made, your stack temperature should not be any higher than that additional temperature. Most of the waste I have found in my numerous experiments in burning coal was in the high or excessive temperature of the gas as it left the boiler, thereby losing the great advantage which the Welsh anthracite coal has over the bituminous coal normally. As Mr. Howard truthfully states, the method of burning bituminous coal is far more crude or less perfect than the method of using anthracite.

Mr. Guldlin—I don't want a wrong impression to go out regarding my discussion yesterday with Mr. Jones. There is no doubt that in the water gas proposition the question of the value of the fuel used depends on the ash. I don't want to say that a fuel having a large percentage of ash will give the same results as one that has not; but if you compare the Welsh anthracite referred to here, which has 90 per cent. of fixed carbon, 5.82 per cent. of volatile matter and 2.59 per cent. of ash, with coke, I think you will find that the fixed carbon stands very close together. Now, the volatile matter and the ash will make 8.41 per cent., which I think will stand very close to what we have in good coke. I mean to say this, that we can get from Pennsylvania or West Virginia coke as good results in water gas operations as you can get from the Welsh anthracite. If you can obtain 1,000 cubic feet of water gas from 28 or 30 pounds of Welsh anthracite you are not doing any better than we are doing every day in the year with gas house coke. If you can get 1,000 feet of gas for less than 28 pounds of coke, by the month, not allowing for any screenings you take out, I am then willing to acknowledge that you have better results, but not till then.

Mr. Jones—When you say 28 pounds, you refer simply to generator fuel, of course?

Mr. Guldlin—Yes.

Mr. Jones—That would be approximately 40 pounds.

Mr. Guldlin—No, I would not say that; because the minute that you bring in the steam fuel question you are dealing with a very uncertain quantity, unless the boilers are run only for supplying the steam for the water gas apparatus. But around the works you have a good many other things for which you are supplying steam, which items are also charged up, and that is the reason why we are very careful in separating the two items.

Mr. Jones—In works making steam for water gas, wouldn't you charge all the steam used on the plant—the pumping of oil, the pumping of water for condensing, etc.—to gas making?

Mr. Guldlin—Yes.

Mr. Jones—So much per 1,000?

Mr. Guldlin—Yes; so much per 1,000.

Mr. Jones—So many pounds of fuel for a 1,000 feet of gas.

Mr. Guldlin—I would not count it for such accounts as keeping holders from freezing, or supplying a general water supply for other purposes, or fire purposes, or anything of that kind. That does not belong there. But I wanted it distinctly understood that when the generator and water gas apparatus is properly constructed, there is absolutely no reason why you should not obtain just as good a result with good gas house coke as with anthracite coal; and practice has borne it out. Of course it is our business to construct the apparatus so as to meet your requirements. In Welsh anthracite for instance you have a large loss in the screening of your coal. You cannot help it, and it should be properly charged up, in view of the fact that you use your screenings for your boiler fuel. Now in coke apparatus the coke as a rule is taken in from the yard, and it contains more or less moisture. You will find when it has been raining for a couple of days that your fuel account runs up. So we also have a certain amount of breeze, but that breeze goes into the generator. Now, of course you can obtain very satisfactory results if you make what might be called gilt-edge tests. You put a certain amount of fuel in your generator, and when you clean out your fires take out the screenings, and deduct the coke or coal from the generator fuel; but I am not speaking of such results. When I mention 28 to 30 pounds of coke, I mean that the coke is to be taken in from the yard in its normal condition, weighed in the generator house, put into the machine, and whatever is taken out is either thrown out, or such as can be used is put under the boiler, but no deduction whatever is made in generator fuel. I did not refer to any design of course yesterday, because, as you all know, I am interested in the construction of apparatus; but since the question has again been brought up,

I want to go on record with the results we have obtained in plant operating continuously. At the same time it is proper for me to state that it is also a plant that makes from 1 to 1½ million a day, and where they have two apparatuses, one of which is, as a rule, not used continuously, but is kept under fire, and the fuel that is used in keeping that machine under fire is also charged up to the gas made. Of course if it was only a question of running one generator, and no fuel in the other, the results would probably be better, but I do not care to advance any theories on this. I am simply giving the absolute facts. I want also to say in regard to water gas apparatus that if a machine is properly designed for using coke it is equally adapted for coal. In other words, if a generator is proportioned so that it contains a proper amount of coke for its maximum make, you have simply to adjust the fuel bed for coal and you can obtain equally good results with anthracite coal. On the other hand you cannot take an anthracite machine constructed for using that kind of fuel and expect to obtain the same results with coke.

Mr. Jones—I would like to say that, when I came out here to the Coast, I found that I had to adapt myself to local conditions, and had to learn a part of my business over again. I found a great difference in the coals of the Coast, a difference in the oil, and a difference in the methods, and I have adapted myself to these local conditions. I think it is very difficult for an Eastern man to speak from an Eastern standpoint on what it is possible to do in California with our fuels.

Mr. Guldlin—I again repeat what I said. I am giving experiences obtained in the East with coke from the Pittsburg and Virginia districts, but when it comes to coke made from your coals of course the results must be modified to suit such. I do not pretend to give any definite statement as to what can be done in that respect. I will also naturally have to adapt myself to California conditions when the question comes up; but I fail to see any reason why coke cannot be used successfully in California, inasmuch as, though I referred to the better grades of coke, we have used coke made from Illinois, Iowa, and I believe Indiana coals. Some of these cokes have of course more or less ash and other matters, and consequently require some more pounds per 1,000 in order to make up for the deficiency caused by the ash. I want it distinctly understood, however, that I am not coming here to tell you that you can do certain things with something that I do not know. I am giving you actual facts, based on operations under definite conditions with definite qualifications, and you can draw your own conclusions.

Mr. Jones—That is what I wanted you to say.

The President announced that, owing to the unavoidable absence of the author (Mr. William M. Parker, Superintendent of the Bellingham Bay Gas Company, of New Whatcom, Washington), this paper entitled

SHOULD GAS COMPANIES DO ALL GASFITTING?

would be read by the Secretary. Secretary Britton read as follows:

In the world of ideas there are "Many men of many minds," among whom are those who possess good judgment founded upon fact, and those given to self-hallucination, derived from highly colored imagination or self-interest, and others who think that you know, or should know it all. We will assume for the present that we do not know it all, and that we have no trade secrets. If we have any ideas or information to impart we will try to be as liberal with them as possible.

When I began this paper, the thought came to my mind that, should I communicate with the several gas companies on the Coast, asking a few questions in regard to gasfitting, I might be able to furnish some interesting statistics. With this end in view, I wrote to 41 gas companies, and received answers from only 24. However, we will forgive those from whom we received "silent answers," and thank the brothers who so kindly assisted us.

I will admit that the writer is only a satellite in the artificial illuminating world, and my endeavors to shine were meant with good intent, when I began this subject by asking the following questions from the members of the Association:

"Does your company do all gasfitting? If not, why?"

"Do you connect gas stoves and run services?"

"Do you employ a gas inspector? If so, why?"

I also requested that a copy of the rules regulating gasfitting accompany the answers.

The first answer was:

"We do not do all of the gasfitting, but, as a rule, most of it, because we have found where others do it we usually have to look after it in the end. We run all gas services. Charge cost. We have no gas inspector. I am maid-of-all-work, and the maid does all the inspecting. Population about 2,800."

The next one said:

"Don't do any gasfitting, as four shops in town do that class of work. We connect gas stoves and services. The superintendent is the inspector. We test with the spring gauge."

The third one writes:

"We have not done regular gasfitting for the past 20 years, preferring to throw it into the hands of the regular gasfitters, thereby gaining their friendship and goodwill. We make it a point to favor those who do the best work at reasonable figures, and we do all we can to prevent any extortion that would injure our interests. It would entail an unwise expense to keep ourselves in readiness for such work at all times. In isolated cases we will do small jobs or have them done, and make no charge when we deem it advisable. We connect gas stoves and run services without cost to the consumer. Our superintendent does the inspecting."

From the fourth:

"As to your rules, we insist as far as possible upon their adoption. We do only a very little gasfitting and always charge at least cost for same. We lay all services and connect nearly all stoves. Our shop foreman does all the testing when it is desired."

The next letter tells us:

"I will answer your questions seriatim. Does your company do all gasfitting? Yes; all it can get. In this connection I would say there was a time when it was *infra dignitatem* for a plumber to do gasfitting, the consequence being that when I took hold 80 per cent. of the houses were not piped; even large blocks did not contain a foot of gas pipe. I need only say that now 95 per cent. of the new houses that are erected are piped, and by us. If I can help it not a house is piped but has its gas stove attachment in the kitchen. If the owners will not pay for it, we put it in at our own expense. You are probably aware that we have the cheapest electric light of any State in the Union. Invariably, as soon as a new house is finished, I hang single iron pendants in every room—of course, nicely bronzed—and set a meter. Result: Out of 40 houses that were built last year in one locality, 38 are using gas to-day, and are among our best consumers. Last year we piped more than 200 houses.

"Do you run all services and connect gas stoves? Yes; we are supposed to charge 10 cents per foot from the building line to the meter; but this is a very poor policy to pursue, as it will frequently prevent a probable consumer from putting in gas. In the blocks which are steam heated we charge $1.50 for setting a stove. We do this because they must use a stove.

"Do you employ a gas inspector? If so, why? Emphatically, no! What is the use of him anyway, unless to give a political heeler a job? We test all piping, whoever does it, without charge, if we go several times, or until the house is perfectly tight."

Sixth reply:

"We have not heretofore done gasfitting, preferring to leave such work to gasfitting establishments. We are, however, seriously considering the piping of cottages at cost as an inducement to the occupant to consume gas. We run service to the curb line, and charge about cost from the curb line to the meter. We connect gas stoves at cost. We employ an inspector of gasfitting so as to know whether or not our rules regarding gasfitting are complied with."

Seventh reply:

"Query 1st: Does your company do gasfitting? If not, why? We do not do gasfitting: First, because there are several shops, and by letting them have the work we have their goodwill, and they all work for the introduction of gas; second, because there is not enough work to be obtained in that line competitory to keep a gasfitter employed; third, because the superintendent, who formerly did such work, has too much other work to do more than inspect work done by others.

"Second: Do you run all services and connect gas stoves? Yes, though generally by employing some one from the shops to do the work under the direction of the superintendent.

"Third: Do you employ a gas inspector? The superintendent is the only inspector employed by the company. We keep a small stock of material on hand and hold on to our fitting tools. We are frequently called upon to estimate on gasfitting jobs, and always comply with such requests, for it is understood by the shops that if they make such charges as appear to be exorbitant we will come into the business, so that there is not much complaint about overcharges."

Eighth reply:

"This is a very small town and there are no new buildings going up. We only employ one man beside myself. We do pretty much all of the gasfitting that is done here. I do the inspecting and test with a mercury gauge. Have very few stoves up. Have not run any separate service for them as yet. It is an uphill business to introduce gas for fuel at $5 per 1,000.

"P. S. Enclosed find Mrs. Brown's troubles in getting the gas turned on in Paris.

"A Chicago woman and her two daughters, who lived in Paris, the American's paradise for a Winter, among other things tell of the obstacles they overcame in getting the gas turned on in their apartments. They wanted gas, so Mrs. Brown went herself to the company's office to subscribe for it and to say that she wanted it immediately.

"'You shall have it within the fortnight, madam,'" said the clerk.

"'Can't I have it before that?'"

"'Not a day, madam. We have to obtain permission from the city before we can consider your application. Then we must also have another permit to put it in. These things require time, madam.' The following day the comptroller of the gas mains in that arrondissement made a call, with a portfolio full of papers to sign. An hour after he was gone the deputy comptroller arrives with three workmen, who examined all of the gas fixtures, called for pen and ink, sat down and wrote out his official report of the inspection, which he signed and called upon Mrs. Brown to sign. Then he took his workmen away. The same afternoon a boss plumber, notified by the gas company, came with two more workmen and made another inspection. Mrs. Brown signed an application for this plumber to examine the gas burners and pipes to see that there was no leak, and the next day three workmen spent the afternoon doing this. They wrote out a certificate to the effect that there was no leak, and gave Mrs. Brown a copy of it. There was an interval of two days; then the deputy comptroller arrived (alone) with another copy of the certificate and proceeded to check the work of the plumbers; he also made out a paper stating that there was no leak. On the same afternoon the boss plumber came back and checked the work once more. Again there was an interval, this time for a whole week, but bright and early on the eighth day the original comptroller made his appearance, his portfolio bulging with papers, and very important. He spread out before Mrs. Brown nine separate documents, stamped, sealed, red taped and covered with official signatures; some were white, some pink, some yellow; some consisted of but a single sheet, while others were small pamphlets, all, however, bore the common brand of a government revenue stamp, the denominations of which were from 2 cents to 50 cents. Mrs. Brown's total indebtedness for fees, including plumbing work, was 86 francs. 'Forty francs of this, however,' the comptroller assured her, 'you will get back when your subscription expires. It is merely a deposit.' 'A deposit for what?" asked Mrs. Brown faintly. 'Why, for the approximate amount of your first month's bill, of course,' said the comptroller. 'The deposit is always graduated according to the number of burners in the apartment.' Mrs. Brown counted out the 86 francs. Then the comptroller, seeing that she had never subscribed for gas in Paris before, good-naturedly explained: 'When your bill comes in at the end of the month, you will have no trouble at all, because all of the charges are tabulated. The first amount on the bill will be for the gas, the second for the amount of the government stamp for the receipt, the third the rent of the meter, the fourth for the charge for the maintenance of the street mains, the fifth that for the house main, the sixth that for the stop-cock in the hall, the seventh that for the stop-cock in the apartment, and so on. It is really very simple.' Three days after the appearance of this man, two others arrived with the meter; following them was a plasterer to place it, and shortly after a plumber to make the connections. The meter was still locked and sealed with a leaden seal. Two days intervened, and Mrs. Brown was about to notify the main office, because she was tired of using lamps, and, anyhow, the two weeks had elapsed. On the next day a man arrived with a book in which the inspector was to write down the record of the monthly consumption. Then in the afternoon, resplendent in gold lace, an entirely new man came on the scene. With a dramatic flourish, he broke the leaden seal with a chisel, and the gas was officially on. It would be quite interesting to know how long it took this company to shut the gas off. It is to be hoped that, should Mrs. Brown visit any of our Pacific Coast paradises and need her gas turned on, that she could get it sooner, presuming that some of our members are more adept with the wrench than with the pen."

Ninth reply:

"In answer to the questions asked me, I have to say that our company has never done any gasfitting, preferring not to go into competition with established gasfitters, of whom there are quite a number. This, purely as a matter of policy. We employ a gas inspector, who is at the same time the foreman of our street main and service work. An inspector is employed for the reason that we consider it essential that property owners, primarily, and ourselves, secondarily, should be protected against imperfect jobbing work, to the end that we may know that pipes in buildings are of the proper size and properly run. A gas company can then guarantee a satisfactory service to its customers and be assured that for all time practically no complaints of poor service can arise from defective piping. Where no inspector is employed and no supervision made of house piping, you are reasonably assured that 90 per cent. of the complaints of poor light would be traceable to imperfect house piping. We are introducing gas services, and set and connect gas stoves, for the reason that, having supervision of work, in services, where a loss by imperfect connections to main and defective pipes would be the company's loss directly, make it a necessity, and we connect gas stoves that the customer may look to us constantly to make all service satisfactory."

Tenth reply:

"Replying to your questions, I would say that we do not do all the gasfitting, as we do not consider it profitable, and the general plumbing and gasfitting houses are in a better position to do the work than we are. We do considerable gasfitting in stores, but very seldom do any concealing work. We run all services free of cost to consumers. We also connect gas stoves. We do not employ a gas inspector, but have a solicitor. We use a spring gauge in testing all gas jobs."

Eleventh reply:

"We do not do any gasfitting in houses at all. The reason is that we would have to compete with plumbers and could not afford to keep a man for that purpose. We have nothing to do with pipes inside of the building after the gas leaves the meter. We set the meter and put in the service pipes free of charge, unless the consumer is a small one, in which case we charge the cost price. With gas stoves we introduce the service, set the meter and stove free. In testing, we use a spring gauge, which seems to give very good satisfaction.

Twelfth reply:

"This company runs all services and connects stoves, but does not do ordinary gasfitting, save in such cases as when the city fitters' figures seem in excess of what the work should cost, and then only when appealed to by property owners. At one time there seemed to be a disposition on the part of fitters to overcharge for such work, but an announcement by the company that it would bid on all work offered had the effect of keeping their prices within reasonable bounds. It was also the custom of the company to offer such work as it secured to the lowest local bidder, and as its price always allowed a fair margin of profit the work was usually accepted. This is scarcely ever necessary now, the fitters making fair prices. The company's proving pump is fixed for both mercury and spring gauges, though the latter is most always used because of its convenience, the mercury gauge being used to test the other. The company prefers to connect all stoves because of the greater knowledge it feels it has of that class of work."

Response from a cautious company:

"Our company does not do gasfitting. We connect all gas stoves and run all services, and make an effort to charge for the cost of putting them in. As to the gas inspector, we do not even inspect the gas fittings officially, though I try quietly to see what is going on most of the time. We are of the opinion that gas companies first took the responsibility of inspecting other people's work, and giving a certificate to the effect that the gas company would have to pay the charge for damages, if any should occur from defective piping. Now that gasfitting is one business and gas manufacturing another, and seeing that gasfitting is an up-to-date art or trade, we propose to take the lead in letting the gasfitters be responsible for the work they do. We propose to show him that a little plumber's wax, on a fitting full of sand holes, that was tight in the Winter while he was getting his certificate, but melted off in the hot Summer months, will not be allowed to get the company into a suit for damages by explosion, if we can renounce all responsibility for what happens on the house side of the meter. We believe that gas companies will have as little trouble from poor gasfitting, if the responsibility is left with those who do the work, as they would if they accept the responsibility of inspecting and giving certificates on work that has been 'waxed' to get the signature of a sleepy inspector. We think that the gas company should not be held liable for anything that happens on the house side of the meter. We have no rules or regulations, but simply offer suggestions."

From a large town:

"We charge for services and setting meters all in one charge. We do no gasfitting, unless it be some little odd job by favor of the foreman to keep good-will, etc. We turn on no gas unless the order accompanies the inspector's certificate. We connect gas stoves direct from the meter, and not from the house pipes; or, at least, very seldom. Now, to keep pace, we sometimes use judgment and make exceptions, but as few as possible. We favor good customers as much as possible, and have no contest with anyone, if it can be helped.

In large cities the gasfitters' associations will not allow the gas companies to do any gasfitting, and they find means of preventing us from doing their work, which, if not legal, are quite effectual, and it is not worth while to have their ill will. As to the gauges used in testing, the mercury is adopted and preferred, because it is entirely reliable and cannot be 'jockeyed.' The other kinds are liable to stick and get out of order. If in order, the spring gauge would answer, but would need verification frequently."

From an "Old Timer:"

"Our company does no gasfitting, because shops dealing in house fur-

Fig. 1

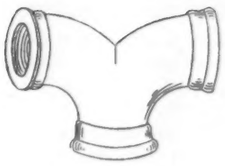

Fig 2

Fig - 3.

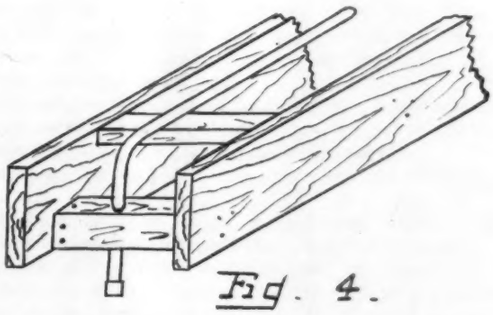

Fig. 4.

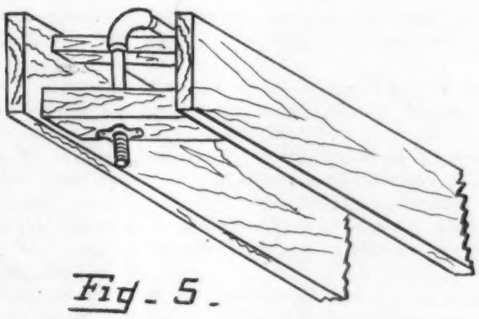

Fig. 5.

Fig. 6.

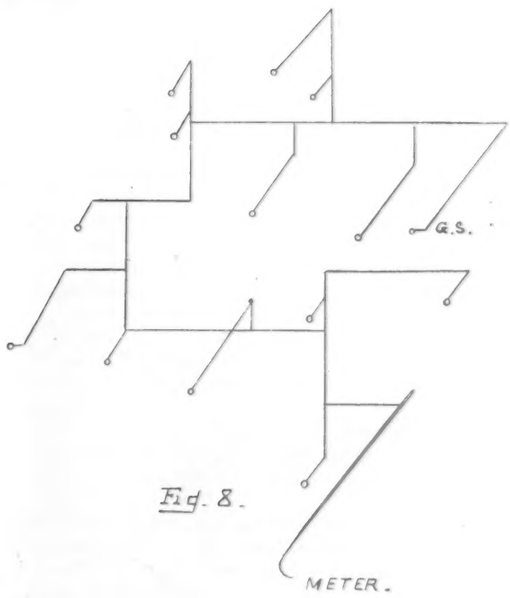

Fig. 8.

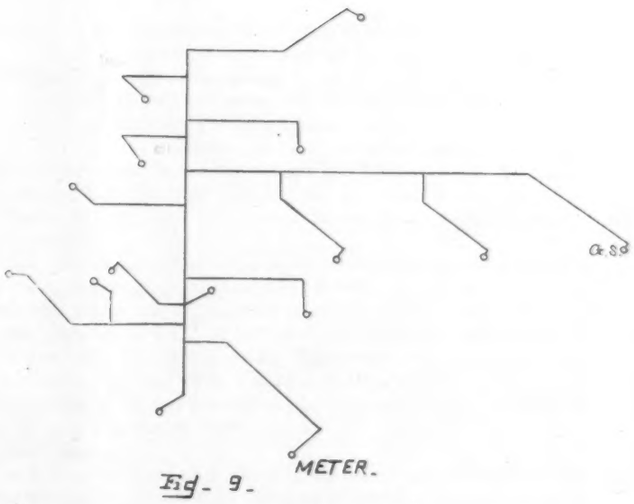

Fig. 9.

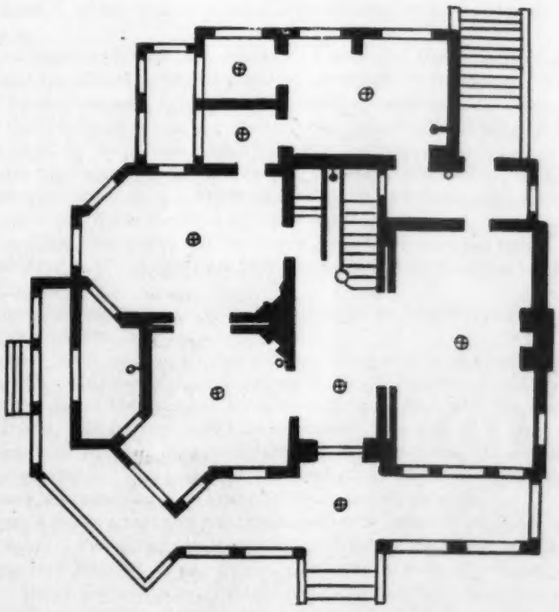

Fig. 7. FIRST FLOOR PLAN.

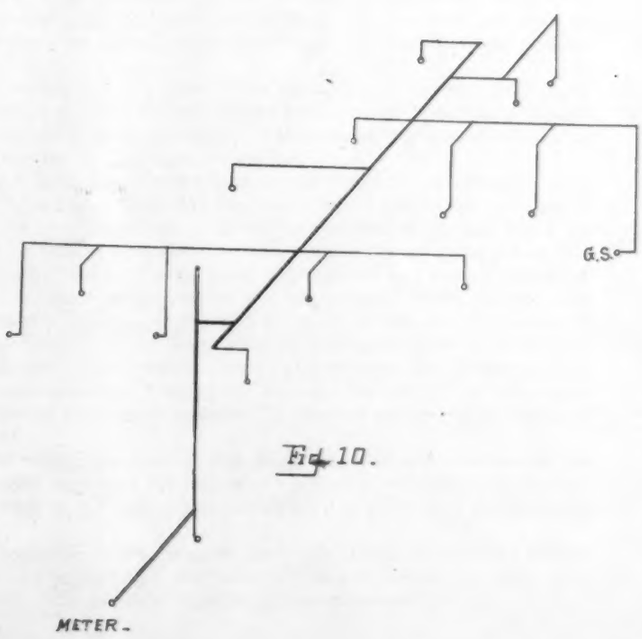

Fig. 10.

nishings furnish a portion of the bonds for the contractors, and claim such work as part of their perquisites. We set gas stoves and services, because pipes for stoves are generally exposed and not put on the proving pump. The pipe should be of the proper size to give satisfaction, and services for like reasons should receive proper attention, proper grade, and their location known. Mercury gauge is used, and we consider it more delicate and satisfactory."

From a congenial company:

"This company does no gasfitting. We think it better to keep in with gasfitters and plumbers so as to keep their good will, for by so doing they will work for the company's interests. We run all services and connect all gas stoves free of cost. The superintendent does the inspecting."

A sympathetic superintendent:

"The superintendent prefers to allow the plumbers and gasfitters living in the town to do the work under his supervision, in order to give them a chance to make their living. We run services to the meter."

As to the company that the writer is connected with I will answer my own questions.

We do all the gasfitting we can get, making extra effort to fit up old houses that were neglected when being built. New buildings we let the outside fitters have, that is, if they can get the jobs; but where we see that the owner does not intend to have pipe put in we do it at cost, sometimes donating the pipe and charging for the labor. We introduce services free, connect gas stoves at cost and set meters free. We manufacture one and two-light pendants out of one-quarter inch pipe, and paint them to suit the customer. We furnish and hang the one light for 50 cents and the two lights for $1.

Previous to this year outsiders did all the fitting. Upon the writer's arrival we branched out into this line. Our consumption has doubled itself over the corresponding month (May) of last year. This speaks for itself.

For testing we use the spring gauge, but when we are in doubt we use the mercury. The spring gauge is handier, but we consider the mercury gauge the better for accuracy and reliability. The foreman inspects the work. We discourage the introduction of exposed work as much as possible, and encourage the use of prepayment meters in connection with the gas ranges at the $1.75 per 1,000 fuel rate.

This concludes my collection on what our members are doing in gasfitting. It tells us that some of them do all the gasfitting they can get, others none at all, a few make a sneak on the outsiders when they can; one keeps his tools ready in case the town fitters do not behave, another holds them down with threats to bid against them if they charge too much, others are afraid to hurt the plumbers' feelings. They would rather have their goodwill than to tackle a branch of the business that they are already one-half engaged in. One is afraid that the fitters would die if his company began to do gasfitting. One tells us that they expect to do most of their gasfitting in the near future. Another says that for a number of years they did all the gasfitting they could get, employing as many as 25 men at one time, but now the town is so thoroughly piped that they let the plumbers take care of the fitting. It is a pity that all of our companies could not say as much. The balance of the companies say that their towns are too small to do gasfitting in.

In corresponding with our members, I requested that a copy of their rules and regulations governing gasfitting accompany their answers. I find that 13 companies on the Coast furnish printed circulars or rules. They all agree that pipe must be run in a workmanlike manner. Some say that bent drops must be used, then follow by saying that where bent drops are not used the nipples must be fastened by straps soldered to them. This mode of fastening drops or side lights is a makeshift and shows incompetency. In other words, it has the flavor of botch work.

Some fitters have asked, "What are you going to do when you cannot get a bent drop in?" A first-class fitter would plan his work so that he could get them in.

Should it be impossible to do so, I would adopt the long thread and waste nut style, as shown in figure 5.

Figure 6 is the waste nut, a very common fitting kept in stock at the supply houses. This way of fastening drops requires a running thread to be cut on the end of the drop and the waste nut run on flush with the bottom of the joist, then fastened with nails or screws. This acts as a lock nut, and prevents the drop from being screwed out when taking the cap off or changing fixtures. This branch of the gasfitter's education has been sadly neglected, and needs as much attention as any part of his work.

Figure 4 shows a neat and substantial manner of fastening all drops and side lights in the ordinary residence or buildings of wooden frames or floor. A drop well fastened is one of the most essential parts of the gasfitter's work. Drops fastened thus could be straightened easily without breaking their hold, as would be in case straps were used. Ability takes the place of luck, and the best appliances accomplish what accident could not.

Gasfitters are rated by the way they fasten their work. This style of fastening gas openings is economical as well as substantial. It consists of a piece of 2 inch by 4 inch wood long enough to suit the requirements, then a brace and bit for the size of pipe that is being used. The cut (Fig. 4) explains the rest.

None of the rules mention anything about fastening floor board over running lines with screws. By all means this should be introduced in all old or new work, more especially in residences. Pockets should be left over each drop fastened in the same way. This leaves the job open for easy access and inspection at all times for alteration or addition.

Testing: None of the companies require the use of any special gauge. Some say the spring gauge and some the mercury, using them under a pressure ranging from 8 to 10 pounds, or a column of mercury from 8 to 12 inches high. Both gauges can be "jockeyed," and the average inspector has been fooled more than once. A suitable remedy would be for the inspector to carry his own gauge.

In the majority I find most companies have barred three-eighth inch pipe, except for three-eighth inch bracket openings; no pipe smaller than one-half inch to run horizontally; risers smaller than three-quarters inch not allowed.

One company, under the head of meters, says that they will be set only in places approved by the company, and will not be set above the first story of any building. This is a good idea. It shortens the meter reader's route and lessens the chance of loss in case of fire.

Another rule is that no split pipes or broken fittings cemented will be allowed. Union couplings are barred. Pipes must not be rusted to stop leaks.

I find there is but one company that objects to the use of bends. Its rule is this: "Bends in pipes must not be used for any purpose." Now, I fail to see any good reason for not compelling the use of bends, and my reasons are: You can make a bend quicker than you can cut off a piece of pipe, thread two ends and screw on an elbow, and there are two joints less liable to leakage. The gas will have an easier flow, be less liable for stoppages. Bent drops or side openings cannot be unscrewed from the fittings behind the plaster when removing fixtures. Pipe costs less per foot than fittings per piece. With bends we have time and economy in our favor. I will refer to this subject later on.

I would recommend the use of galvanized fitting for the reason that it is the common practice to calk up sand holes in black fitting. A tool similar to a nail set is used in driving a portion of the material into or over the sand hole, thus stopping the leak. It may hold long enough to stand final testing, but does not make a qualified job. Rubber hose should be condemned for gas stove connections. Why? Because the stove business has passed the experimental point, and it would lessen the chances for our consumers in taking the carbon-monoxide route.

Another rule says:

As soon as pipe is put into any building, new or old, the gasfitter must make on the back of one of these circulars a complete plan of the work, with lengths and sizes of pipe plainly marked, and must file the same in this office. No pipe will be inspected until this is done. I have found scores of fitters who could not draw an intelligent plan of their work, either before or after the pipe was in the building; and after they had made an attempt to draw a plan, neither themselves nor the inspector could read the plan.

No doubt you have some of the so-called plans on file. They appear as though the fitter had followed the tracks of a wild goat that was laboring under very great excitement. The accompanying cuts will show what the fitters can do in our town in this line.

Fig. 7 is the floor plan of a residence that I took to two different shops in this city and asked fitters how they would draw a plan of the gas pipes to meet the openings marked. Fig. 8 gives the result of one and Fig. 9 the other. I presume my hearers have seen better. Fig. 10 gives you an idea how I would do it. It really looks too simple to talk about. Almost any school boy can draw the outlines of a box or table. There are only three lines used to represent the object. The legs of the table give the direction of the risers and drops, the length gives the running lines, and the width gives the direction of the branches. Some call it the figure four or triangle plan; architects denominate it isometrical drawing. However, it does not require an educated draftsman to represent the pipe lines on paper in an intelligent manner.

With a little time spent in instructing the uninitiated, it strikes me that we would soon have the records of our pipe in buildings in such shape that when we did want to gain information it would be in a comprehensive form.

A composite circular suggests itself. As several of the rules I have received are antiquated, I will discard them and include the more useful features. This will serve to produce a more modern set of rules.

THE CITY GAS LIGHT, HEAT AND POWER CO.

Gas Piping Rules.—The following regulations have been adopted by this company for the guidance of gasfitters, architects, builders and contractors, and the inspector is instructed to observe them closely:

Table Showing Length and Size of Gas Pipe Which Should be Run.

Size.	Greatest Length.	Greatest Number of Burners.
¾ inch, vertical only,	15 feet	2
½ "	25 "	5
¾ "	50 "	15
1 "	75 "	30
1¼ "	100 "	60
1½ "	150 "	100
2 "	200 "	200

To estimate the number of burners, allow 1 burner for bracket lights, 2 burners for ¾ drops, 3 burners for ½ drops, 1 burner for kitchen, bath and hall drops, and 3 burners for stove outlets. All horizontal pipe must be at least ½ inch in diameter.

Riser Pipes.—No riser pipe allowed smaller than ¾ inch. End of riser must be located at a point designated by the inspector. The pipe will not be tested until the riser is extended to the designated point.

Drops.—Use bent drops in all cases where possible. Where nipples drop from elbows or T's, use waste nuts to fasten with. The company insists that all openings be firmly and properly secured to the satisfaction of the inspector. In stores, parlors and public halls all drops must not be smaller than ½ inch. All drops are to extend 2½ inches below the joists, and bracket openings extend out 1½ inches from studding.

Piping must be run in a workmanlike manner, at right angles with the building, be well secured, and must use bent pipe in place of elbow fittings wherever possible. There must be no traps, no cement or unions used. No split pipes or fittings can be doctored. All outlets must be left capped when building is finished. Pipe must not be rusted to stop leaks.

For hotels, churches, theatres or public buildings, where a large amount of gas is to be used, the pipe must be of increased size, and plans of same should be submitted to the inspector before commencement of work.

All pipe between the meter and gas main will be run by this company only, and fitters must not disconnect or interfere with any of the company's meters.

On the back of this circular the gasfitter should make all plans of work, with length and size marked with figures, and submit same to inspector before testing is requested.

Concealed work will be inspected, and due notice must be given of time inspection is desired. No charge is made for such inspection, and information and suggestions will at all times be cheerfully given. but unnecessary visits must not be requested, except at the expense of party doing work. No work or alterations should be made to piping after inspection, without due notice and re-inspection. All testing will be done at a pressure equal to 10 pounds per square inch, mercury gauge preferred.

In making joints the lead should be put on the male end of pipes and fittings and not in the fittings, as lead so placed will be pushed forward by the pipe with liability of closing same and causing stoppage.

It is the intention of the company to adhere to the above rules, and no certificate of inspection will be given when they are not complied with.

Parties interested are requested to allow no bill for gasfitting unless accompanied by a certificate of inspection, which is an evidence of work being properly done, and architects should include such a clause in their specifications. Particular attention should be paid to piping houses for gas for fuel, as it is rapidly taking the place of other fuels, and the work is best and cheapest done in the original construction of the buildings.

At all fireplaces the pipe should be run to right hand side of same, about 2 inches clear of finish and 4 inches above the floor, and the same in relation to flue pipes in rooms without fireplaces, keeping about 15 inches to right of flue. In rooms containing neither fireplaces nor flues, an opening for gas stove should be conveniently placed and about 6 inches above the floor. These openings should be ½ inch, and pipe to supply same should run from nearest direct feeding pipe.

In kitchens pipe should be properly placed for gas cooking stove, and should usually be ¾ inch. All additional or detail information will be gladly furnished without charge. When so requested the company will be glad to give an estimate on cost of piping buildings. Pipe is cheap, and it should never be costly work. You can have a moderate job done at moderate cost.

Location.....
Work done by.....
Owner of premises.....
Gasfitter.....
Inspected by.....

Approved,
CITY GAS LIGHT, HEAT AND POWER COMPANY.

Date.....

Note.—A first class job when complete will have the floor boards over main running lines put down with screws and will leave pockets over drops. This gives easy access to the pipes when alterations are needed.

WHY ARE WE DOING GASFITTING, OR WHAT MADE US DO SO?

In this city there is a large hotel that cannot be supplied with gas because of defective piping. There is about 30,000 feet of pipe in the building, put in by "practical" men at the time, and was never made tight. We have not made the repairs as yet, and in the meantime we are losing a valuable consumer. One of our theatres is supplied with gas, but owing to the pipe not being the proper size they cannot use over one-half of the burners at one time. This job we will have to straighten out if we want the consumer. Our court house is using gas, but the job is not tight and never was. The gauge will loosen itself in one hour after being pumped up. This needs our immediate attention. Another large three-story brick building had to be abandoned on account of poor piping. The plumbers and fitters have hurt our company's business more than the opposition has.

Not long ago we were extending our mains into a district where the houses had never been piped, and, being anxious to supply everybody as soon as possible, I asked a prominent plumber why he did not go after some of the jobs. His answer was, "Well, if anybody wants gasfitting done he will come after us for it." I asked another the same question. He said, "How do you expect me to get jobs when the gas company is doing the fitting at cost?"

I told him that we would donate the pipe on all jobs he could get. He got one house. The pipe cost him nothing. He charged 5 cents per foot for putting it in; the bill amounted to $4.50. It took him one day and one hour. He has not tried any more houses, as he says there is nothing in it for him.

Being very busy, we turned a fair sized job over to another plumber, giving him four days' notice. His promise to attend to it without fail was not kept. Now the prospective consumer gets his "currents" from the other company.

Still another reason: You take a common cottage, say with six rooms, and let the plumber figure on fitting them up, and he will charge:

Six drops @ $2	$12.00
Gas stove opening $2	2.00
Six gas fixtures @ $1	6.00
Six Welsbach lamps @ $2	12.00
	$32.00

We know at the start that this figure is too high for the class of people we want to get. We figure at cost as follows:

Six drops @ $1	$6.00
Stove opening $1	1.00
Six pendants @ 50 cents	3.00
Six Welsbach lamps @ $1.25	7.50
	$17.50

This being at cost, we have nothing to lose and gain a consumer we would not otherwise.

When this town was built 90 per cent. of the residence portion was not piped. The town fitters are not well enough up in the art to conceal their work in a satisfactory manner. They wait for the jobs to come to them instead of going after the jobs. We want more consumers now, not next year; and the only way we can get them is by going after them.

When times are poor we are bothered with the "mushroom" gasfitters furnishing an undesirable class of work, catered to by the public in general because they are cheap. When times are good, this same class form into unions, thereby bringing the wages up to a high tension. The public has to stand it, and it is injurious to any gas company.

After I had started this paper, I found myself traveling in an old rut—that is, rehearsing an old subject, but have ventured with my views hoping that I might strike a new rut in my travels. For the last 12 years I have been engaged in gasfitting in several localities on the Coast, from Southern California to Northern Washington, and profited to some extent by observing the different modes of handling gasfitting.

In learning the trade, I was taught to make all bends in the pipe by first heating them, an operation that is entirely discarded now. We never used an elbow where a bend could be placed. Gasfitter's cement was allowed on all joints by first heating the fittings and the end of the pipe. The fittings were cemented inside and out and screwed together hot. All openings were fastened in a substantial manner. Floor boards over running lines were put down with screws. Pockets were left over drops and plugs were left in fittings for likely extensions. Testing was made with the mercury gauge, 13 inch column. All buildings were measured and pipe plan drawn and taken to the shop, where we got out the work for the job, and when we took the pipe to the building everything had to fit in its place. The highest standard of workmanship was employed that was known at the time. As I changed my

locality, I saw the change in the mode of operation. Heating the pipes to bend them was too slow in this town. It was the custom to move the shop to the job. Several bundles of pipe, fittings, bench tools, etc., went to the building. It was a cut and try job. That is, cut and thread one piece and put that in before another was cut, instead of making one job of measuring and one of cutting. Red lead was used, as the fitters could not be trusted with cement. Pipe was bent cold. It made no difference how a bend was made. The object was to get one.

It was "awful" amusing (I use the word "awful" knowingly) to notice some of the bending performances. The "Jour." wanted an offset in the riser, so he skirmished around to find a convenient place to bend with. He first tried between two joists, then under the sidewalk, next in the fork of a tree, now under a car track, then between two posts, and finally got what he wanted, but found himself a block away from his job.

It was necessary on this building to follow the rules of the gas company. I noticed a half-inch pipe bent around a chimney, the last end being used for a drop. It was explained to me that one of the rules of the company was that 30 feet of pipe, one-half inch in size, should be used for 4 burners, and as the pipe was too long for the distance he wanted to run he had no other way of getting the pipe in.

The next town I worked in after finishing my first gasfitting job I sent for the inspector. He was about as practical as the average man burdened with the name. He was over an hour examining the job, and finally ordered out what he thought several lengths of pipe, and told me he would blacklist me if I attempted another job in the town. He said that he never had to inspect the jobs of old fitters, but as I was a new one he was glad that he had witnessed my style. I had quite a time convincing him that what he had ordered out was the bridging irons or anchor rods, being bent down in the center and up at the ends. He thought that they were trapped gas pipe. He admitted his mistake and begged me not to say anything to the company about it.

In another city a gentleman wished his house fitted up for gas, but the gasfitters all belonged to the union. They only worked 8 hours a day and wanted $4 per day. He decided to do the job himself, so he hired a tramp fitter and bought the pipe and fittings, told the fitter what he wanted, with instructions to call at the office when the work was completed and get his pay. It was an old six room cottage. The man was there a week. He sold the pipe and fittings, got his pay and then skipped out. He had put in bent drops and fastened them well, but he left all the rest of the pipe and fittings out. The owner of this house has had $40 worth of experience, and now is a full-fledged gas skeptic.

Another fitter was sent to a nice residence with instructions that it was a day's work job. Here is where the fitter is in the height of his glory and the owner's pocket feels like a sieve. This fitter was a society man whose company and hours he was not particular with. Next day the helper had to stand watch while he was wrapped in the arms of "Murphyous." The helper did most of the work by threading the pipe without the use of oil, did not lead some of the joints, but he got through too soon for the "Jour.," as he had another "date." Then he made the helper paint the pipe. They came to the shop and reported the job finished but neglected to state how much pipe was used. The helper was given a 50 foot tape line to measure the job with, but came back and said that he could not measure the pipe because the tape line was not long enough. Some time after this the owner wanted the gas turned on, but the job would not hold, or as the professional fitter said, "would not hold bricks." The pipe was taken out and refitted.

Another trick that one of these "piporial" artists was guilty of doing, when he could not get the job tight, was to cut the section that was giving the trouble and put in a stopcock. He had it shut off when the final test was made, and turned it on when the job was left. The company turned gas on shortly afterward and discovered the defect, and as they had furnished a certificate accepting the job they had to make it right.

One more trick I have discovered in my travels. You perhaps have heard of the different tricks played on the spring testing gauge, such as cutting out a tooth on the tangent inside of the gauge, so that when the hand of the dial reached a certain point between the 8 and 10 pound mark it would stand there in spite of a leak in the pipe. But this time it was a mercury gage, and the fitter could not get the job tight, and it was final testing day. The inspector was up the street. The fitter knew that the inspector would keep both the helper and himself in sight while the test was being made, so he borrowed plumber's helper to hold the soldering furnace under the riser when the signal was given. This expanded the air in the pipe and counteracted the leak. For fear he would get the air too hot and the mercury would rise, the fitter's helper would whistle "Up in a balloon, boys" when the mercury would rise; then he would whistle "Down went McGinty," when the mercury was falling. By this aid of the musical helper the job was about to be passed O. K., when the fitter and the inspector went down into the basement to take the cap off the riser. When the helper whistled "Tramp, tramp, tramp, the boys are marching," that meant to get the firepot out of the way. The unexpected sometimes happens, as it did in this case. The inspector, in an unguarded moment, got hold of the pipe where the boy had held the firepot. The helper did not whistle "There'll be a hot time in the old town," etc.; but this fitter does not try to whistle his jobs tight now.

In one of our southern cities during prosperous times there was considerable house moving going on, and the rivalry existing between different shops was carried to extremes. I saw the fitters piping a house while it was on the move. As the fitters worked only 8 hours and the movers 10, the fitters had to hunt for their job next morning. I did not learn how long they were in getting the job tight.

The next town was a union town, one of those where you had to join the union or you could not get work. While we were in Rome we had to do as the Romans did—"join." I witnessed all kinds of men doing all kinds of work. The botch and the expert received the same salary, and worked the same number of hours. As long as you had the price of a cigar or a German lemonade, and was liberal with it, you could get most any kind of a job passed, and the public had to stand it whether they wanted to or not.

It may seem to you that these explanations of my observation have been handled with a great deal of carelessness, but they are facts that show to those not initiated the amount of brain displayed to gull the people by those who call themselves gasfitters or plumbers. Also, what the dear public has to contend with and pay for.

The tendency naturally in such instances is to discourage the willing consumer, and to retard the present and future progress of our industry. These are frequent occurrences, and I dare say would not happen quite as often if the work were being furnished from the gas company's shop.

Here are some reasons why we should do all gasfitting. A gas company knows what is essential to promote and better its own interests through the care of its principal tributary, the consumer, while the gasfitter does not. The kicks that go to the gas company's office never go to the plumber's office. When a plumber finishes his work on a building he has no further interest. The gas company has a continual interest. We cannot give the inspection of buildings proper supervision until we can compel the plumbers to notify us in time to make a thorough and complete inspection, and I doubt whether without legislation we can compel the plumber or anyone else to do that; so the only way out of the difficulty is to do the work ourselves. Our competitors are wiring buildings at cost. Is not this one good reason why we should pipe buildings at cost?

The gas company knows, and the plumbers do not, whether there are two main pipes in a street; whether there is but one and where that is located; whether in the street in front, or in the alley in the rear, and the size of the mains. The gas company knows the proper manner in which a building should be piped; whether it is at an altitude above or below the gas works; whether to place a riser in an outside wall, where it is sure to freeze in winter, or in an inner wall where it will not freeze, and where the point of distribution is most central.

A gas company pays very marked attention to the manufacture of its gas, and is always adopting improved means and devices for the improvement of the product. It should pay just as much attention to the distribution of the same. In other words, I think a gas company should watch the course of its gas from the retort to the consumer's burner, and give the distribution as much close attention as it does the manufacturing.

In regard to the manufacture and sale of gas as a commercial pursuit, I think it should be so treated by the gas company. If you do not make an effort to sell your product, who will? The wholesale merchant has his agents, the retail merchant has his, through the advertising mediums; and the average gas company at present has its advertisement through its product only. Because one man burns gas is no reason why another should, or will, but he should be induced to do so; and a strong inducement would be to see that he has his premises cheaply and properly piped, his service pipe amply large and meter correct, good fixtures and in good condition, proper kind of burners for his locality, and the quality of the gas good.

The taking in hand of internal gasfitting by gas companies would, I think, have a tendency to decrease, instead of increase, the liability for damages, because of leaks, explosions, etc., for by doing so they can greatly improve the character of their work, thus lessening the chances for accidents. Many accidents have been caused by carelessness on the part of the plumbers, and very few are caused by bad work on the part of the gas company.

Damages have been recovered by individuals from gas companies as the result of accidents caused by the ignorance or carelessness, or both, of plumbers, simply because it was the company's product which was contained in the pipes. If a gas company is assumed to be financially responsible for all accidents occurring through the poor work of the professional fitter, then I think the sooner it takes in hand this branch of business the better.

Gas companies should enlist the co-operation of the architect, the contractor, the builder, the owner or agent and the manufacturer of and dealer

in all gas appliances. The co-operation of these individuals with the gas companies would be of more pecuniary benefit to the latter than the combined efforts, as now put forth, of the united kingdom of plumbers. For they, especially the dealers and manufacturers, are sufferers with the gas companies at the hand of the plumbers.

When gas companies have to fight the municipal authorities as well as their competitors they cannot afford to be idle, and should avail themselves of every opportunity to further their interests. A plumber is not a gasfitter, but they both handle pipes. There is just as much difference between them as a shoemaker and a harness maker; both use leather in their work.

Some architects, in their desire to be "thoroughly up-to-date," have counseled the owners of the buildings under their constructive charge to place entire dependence on electric wiring for the lighting of the structures, to the entire exclusion of gas piping; and this even in instances where no provision has been or is to be made for the maintenance in the building of an isolated electric lighting plant. In several instances the owners of such buildings have experienced the human impulses of the electric lighting suppliers, who have furnished, under contract to last for a year, currents to lamps at so much per lamp per hour, and at the expiration of the contract have demanded a round increase in the rate for a renewal. Of course the owner has opportunity for relief by the placing of an isolated system, but he could have had that in the first instance through having the structure piped for gas. Further, in the latter instance the "relief" would have amounted to virtual insurance from any ill effect of the human impulses that will creep out in the commercial life of corporations, be the latter electrical or otherwise.

I maintain that if the gas companies made it a business of doing gasfitting the owners of prospective buildings would be sought for and made acquainted with the fact that all of the architects are not quite up-to-date, and that gas is a necessity as well as a luxury.

Don't allow owners to be hoodwinked into the idea that gas is on the decline. Furnish an estimate, even if you do not perform the work, keeping the amount within reasonable limits, making it an inducement to have the building piped. In view of these considerations I am of the opinion that gas companies should do all gasfitting.

As to companies carrying a large stock of useless material, I do not think that gas pipe and fittings should be regarded as such. Any company that is doing service and stove work should not be far from being prepared for gasfitting. You have one foot in the field now. No great expense is necessarily incurred in entering upon this branch, as all companies have shop room, tools and material. Below is a list of tools I use for the average residence jobs: Tape line and rule, two pipe wrenches, gas plyers, ratchet brace, ⅜, ½, ¾, and 1 inch bits, pipe size, hand saw, compass saw, bell bit, plumb bob, two floor chisels, three pound hammer, light hammer, gouge and wood chisel, screw driver, pump and gauge, pot Dixon's compound for pipe joints.

For the sake of an argument we will take a town with a population of 2,000, having no opposition and gas at $3 per 1,000. As a general thing there is a lack of interest shown towards throwing out extra inducements to gain new consumers. If the consumer wants gas he comes after it of his own free will, and, of course, is supplied if on the line of mains. And there the company stops. There is no use of reaching out further, as the income is paying interest on the investment. At the same time there is a large field open for opposition and capital to get in its work.

The question arises, "Is it policy to get every available consumer, or lay the superintendent on the shelf and say that you have accomplished enough, or wait until the insurgents have arrived, and then reduce the price of gas from $3 to $2 per 1,000? Right here you lose one-third of your income, to say nothing about the consumers the opposition are bound to take from you. Then you wake up from your Rip Van Winkle era and realize there is something to be done. What do you do? Gasfitting is about the first thing thought of. You will advertise that you will pipe all buildings at cost, furnish gas fixtures, etc., at cost. Reduce the price of Welsbachs, run services free, connect gas stoves at cost; in other words, throw out molasses for your flies. Off goes the superintendent's coat and up go his sleeves, prepared for a long and tiresome effort to gain what he has lost. With a great deal of energy and push he perhaps holds his own, or may double the sendout as some have done. All this forced energy might be saved if we would not wait until some opposition arrives. What we need is our own gasfitting shop, with a practical man at the head of it. As the results of poor gasfitting you get an overdose of free advertising that you have no reason to be proud of.

Self-preservation is one of Nature's first laws, and I say that we fail to protect that law when we stand idle and allow the plumber to do our gasfitting, charging such prices and furnishing such work that it is a detriment to our interests, and again allowing a large field to be left open for opposition to work on. It looks feasible that, with a first-class gasfitting shop and all our commodities, except gas, furnished at cost, our sendout would more than double itself, without the opposition forcing it upon us. Gas at $2 per 1,000 on this Coast is considered reasonable; $3 is high. I have noticed that the opposition generally strikes the $3 towns first. Most companies are quite adept at manufacturing gas, but neglect the manufacturing of consumers.

First-class gasfitting at cost will manufacture any kind of a consumer, and the prepayment meter will serve to hold the doubtful ones longer than any other method.

We are in the midst of quite a healthy opposition, with prices that the people will not stop to think twice before they decide which to adopt; such as the following advertisement taken from our daily paper:

Arc lamps 2,000 candle power:

10 o'clock per month	$5.50
12 o'clock per month	6.50
All night per month	8.00

Incandescent lamps, 16 candle power, residence rates:

1 lamp per month	$ .75
2 lamps per month	1.00
3 lamps per month	1.10
4 lamps per month	1.20
5 lamps per month	1.25

Contracts for six and twelve months.

Of course these rates have captured some that we could not touch, but one thing I have noticed is that we have not lost a single consumer who was using a prepayment meter. We have these meters placed with all classes, and our company does not order any other kind. Our rates are $2 per 1,000 for illuminating and $1.75 for fuel.

We use the American prepayment meter and have about 40 out, this being the first year of their introduction. They have proven very satisfactory.

In most cities where there is a gas company in existence, you will find very few people that do not know of the fact. The few consumers that the company has are acquainted with its methods of supply, equipment, prices, etc., but how ignorant you will find the non-users of gas, caused mostly by the lack of a liberal use of printer's ink or other means of advertising. Where there is no competition no incentive is shown in that line. Where there is opposition there is a fear of antagonizing their opponents, or, as one manager told me, he did not advertise because he did not want to show his hand. Besides, he did advertise for a whole month last year, and he did not reap any noticeable benefit. He believed in the "hold-on-to-your-nickles-and-let-the-dollars-fly" plan. There are two sides to most questions. Here are two inky ones.

There was a man who advertised
But once—a single time.
In spot obscure placed he his ad.,
And paid for it a dime.

And just because it didn't bring
Consumers by the score,
"All advertising is a fake,"
He said, or, rather, swore.

He seemed to think one hammer tap
Would drive a nail clear in;
That from a bit of tiny thread
A weaver tents could spin.

If he this reason bright applied
To eating, doubtless he
Would claim one little bite would feed
Ten men a century.

Some day, though, he will learn that to
Make advertising pay
He'll have to add ads to his ad.,
And advertise each day.

I fear I have tired you with a somewhat lengthy article, but will ask your kind indulgence before bringing this paper to a close.

Electric lighting has sharpened the zeal and inventive power of those engaged in the manufacturing and distribution of gas.

Part of our energy in this direction is brought out in the shape of a gas pipe bending machine. (See Wrinkle Department.)

Iron piping does not seem to keep pace with the changes usually expected in general practice, while other departments are improved at every opportunity as competition tightens. It is probable that the inner surfaces of the pipes made to-day are smoother and more uniform than the first pipes that were made.

It appears from the best information we can get that, about the year 1825,

in order to meet the largely increased demand for gas tubing, it became evident that some better mode of manufacturing gas tubes should be employed than the process of welding gun barrels. James and John Russell appreciating the fact, began the making of improved gas tubes. They conceived the idea, and patented it, of welding their tubes by butting the edges together, produced by drawing the iron through a die. Next follows the invention of the socket or coupling. T's, crosses, elbows, etc., were forged to order until the cast and malleable fittings arrived. But what I would like to call your attention to is the need of introducing a system of gasfitting that shall cause less friction than that in use. I would where possible, do away with all elbow fittings and use bent pipes instead. The socket is bad, the elbow is worse, and the T worse than the elbow. Water, steam or gas will follow a curved course in a pipe of uniform section almost as easy as it will follow a straight pipe, while it always makes strong objections to being driven through the common elbow. The adoption of long radius T's and elbows would be a move in the right direction, and will make further improvement more easy of attainment. Our piping system is practically the victim of mistaken ideas of what constitutes cheapness, perhaps combined with the constitutional disregard of the fitter. The prevailing idea all along has been, not what arrangements would be best for the transmission of gas (if the gas would not actually refuse to flow), anything would be good enough so far as that was concerned, but what would be the cheapest, quickest, and easiest connected if five minutes could be saved in putting up a lot of pipe. No other consideration as to the permanent use of the pipe is noticed.

If you know all about the discounts you know how wonderfully cheap the fittings are, but the system does not produce a wonderfully neat and satisfactory installation. Cheap to put up might be a proper consideration, but to be cheap to operate or maintain should be the chief consideration.

I have illustrated in Figs. 1, 2 and 3 the Y branch and tees, so as to be more fully understood. By introducing this style of fitting to take the place of the common fittings so generally used, and by using bent pipe in place of the common elbow, less friction would be the result. Pipes could be blown out easier when clogged. It insures a better service, is neater looking and costs no more than the old way to introduce. The Durham system of draining in all large buildings is adopted for the same reasons.

Hoping that I have at least entertained you, and at the same time left you ample room for discussion, I will, with the firm belief that gas companies should do their own gasfitting, close

Discussion.

The Secretary—Mr. Parker has gone into this subject with great thoroughness, and we all know, from the Wrinkles which he has given us in other years, how inventive he is. I know when this paper is published it will be a thing for you to study over and save money by.

Mr. Osborne—I believe the use of galvanized fittings is very essential and saves a great deal of money and time. The extra cost of such fittings does not amount to anything compared to the time that you very often consume with common fittings in which sand holes exist. If I were a gasfitter I would use nothing but galvanized fittings in all piping, using all the bends possible.

The President—Regarding the use of galvanized fittings I think ordinary fittings known to be good and tested to be sound will give as good results as the galvanized ones. I suppose Mr. Osborne's idea is that galvanizing would stop up any sandholes in the pipe. I suppose it might stop small ones, but not large ones; and galvanizing might not even stop up the small ones permanently.

Mr. Osborne—The large leaks we can find all the time, but little ones are those that bother us.

Mr. Aldrich—One word in answer to Mr. Osborne with reference to malleable fittings vs. galvanized. I would not advocate using galvanized fittings, for the simple and only reason that if you purchase your fittings of a reliable firm you need have no fear of being troubled with many sandholes. I suppose for a small company we use more malleable fittings than any other two or three companies in the State. Regarding Mr. Parker's able paper and some of its sentiments I find myself making the same remark that Mr. Jones did to Mr. Guldlin, when he said the conditions in the East and the West are so different. Speaking figuratively, I feel myself between the devil and the deep sea. Being at Spokane, I am neither East nor West, in this respect, and I can well imagine that being in San Francisco I must expect to see an electric drop and a gas fixture hanging side by side in a house; but as Mr. Jones says, you have to take conditions as you find them; you cannot make them. The reason we do so much fitting, and why I advocate that where possible gas companies should enter the field of gas fitting, is because under proper management the buildings in course of erection are sure to be properly piped. When I took hold of Spokane it was *infra dig.* for any plumber to pipe a house. Two-thirds of Spokane was not piped. There are 4, 5 and 6-story blocks there without a foot of pipe in them. One of the extraordinary phases of gas supplying, to my mind, and one of the contradictions that take place between theory and practice can be no better exemplified than at Spokane, where I have in some buildings ran up temporarily, to supply one or two stoves, a half-inch riser. In the Eagle Block, on Riverside, a half inch riser supplies no less than 9 gas ranges, and I should be confounded were anyone to speak to me in reference to circulations and distributions and capacities and sizes, etc.; but I only know it as a fact that a half-inch riser supplies 9 gas ranges, and I have never had one complaint of short supplies. To my mind the question of piping is one of locality. If you find that the architects are piping their houses on their plans, I would say by all means don't interfere with them; but where you find the architect just considering the fact of putting up a house at its lowest cost, irrespective of the internal furnishing, then I say it is the duty of every gas man who has the interest of the stockholders at heart, to go after that architect and insist if possible on having him pipe the house properly. That is the reason why Spokane does so much piping. I have at present three men all the time piping houses and buildings. I won't enter into the matter of how this came about, but will say that now the architects, instead of my going after them, bring their plans to my office and I measure up and give a price on the job. As I said before I do 95 per cent. of the gasfitting in the town, and intend to do it as long as we remain in the business.

Mr. Gregory—I would like to ask Mr. Aldrich what the gas pressure is where those 9 gas stoves are supplied.

Mr. Aldrich—Twenty-four tenths.

Mr. Gregory—That is quite high. The opposition in our locality is an electrical opposition. Once in a while in advising the wiring of buildings they advise also that it is not necessary to put in gas pipes, just simply to wire the building, and electricity will be all-sufficient. In my canvassing I did not think it was a good idea to tell the people it was not necessary to wire the buildings and just put in gas pipe. Instead I said it was better to both pipe and wire the building. I thought we were able, as gas men, to go into honest competition, and after they put in both wire and pipe we would be satisfied with the result.

Mr. Clements—I would like to ask Mr. Gregory if the electric light company and the gas company are not one, and that if the user does not take one kind of light or the other.

Mr. Gregory—Well, the opposition and ourselves are not one. We have an electric plant. I did not think at the time though about furnishing our own wiring. It would be very convenient to furnish our own light on the wire, but as I said before I felt that the opposition of gas against electricity, after advising that the wire and pipe both be put in, is suitable to us. We can generally get in. You see I represent the gas side of it entirely, and I feel as though gas can entirely overcome electricity or opposition electricity. I advise the wiring and piping of the buildings, and then we will stand by the result.

Mr. Osborne—I would like to ask if any company here operating a combined plant inspects the wiring. I consider that fully as necessary as gas inspection, and there is more chance for doing poor work in wiring dwellings than there is in piping them.

Mr. Gregory—I believe the city of San Jose employs an electric inspector. I presume he has to inspect all wire in all houses, the city inspector I mean; and sometimes those people are charged with being very sleepy inspectors.

Mr. Steinmann—In Sacramento, where they even wire the trees, we have no inspectors. In my house I have had wiring done three times, and they said they gave me a good job, but if they did I don't know what the other fellows get.

Mr. Hollidge—Referring to the remarks of Mr. Gregory as to the matter of wiring. Providing you own both plants it is all very well, but if you are wiring for the purpose of other people coming in in competition with your gas or Welsbach lamps, you will find this characteristic of the American people throughout the country, wherever they can attach a button and light the whole place up, they will prefer to do so rather than get a Welsbach lamp. Even although the light is insufficient and the illuminating capacity is not in the electric light as it is in the Welsbach lamp, yet, if they can press a button, they will prefer it. You will find it so throughout the world wherever you go; persons will in all probability do as much as they can to avoid as much work as they can. In all cases I find it so, and there is no way for the Welsbach lamps to come into competition with the 16 or 32-candle power incandescent electric lights to-day, unless we can get a cheap automatic device that will enable people by touching a button to light their Welsbach lamps with the same degree of labor that they can light the elec-

in all gas appliances. The co-operation of these individuals with the gas companies would be of more pecuniary benefit to the latter than the combined efforts, as now put forth, of the united kingdom of plumbers. For they, especially the dealers and manufacturers, are sufferers with the gas companies at the hand of the plumbers.

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4 lamps per month	1.20
5 lamps per month	1.25

Contracts for six and twelve months.

Of course these rates have captured some that we could not touch, but one thing I have noticed is that we have not lost a single consumer who was using a prepayment meter. We have these meters placed with all classes, and our company does not order any other kind. Our rates are $2 per 1,000 for illuminating and $1.75 for fuel.

We use the American prepayment meter and have about 40 out, this being the first year of their introduction. They have proven very satisfactory.

In most cities where there is a gas company in existence, you will find very few people that do not know of the fact. The few consumers that the company has are acquainted with its methods of supply, equipment, prices, etc., but how ignorant you will find the non-users of gas, caused mostly by the lack of a liberal use of printer's ink or other means of advertising. Where there is no competition no incentive is shown in that line. Where there is opposition there is a fear of antagonizing their opponents, or, as one manager told me, he did not advertise because he did not want to show his hand. Besides, he did advertise for a whole month last year, and he did not reap any noticeable benefit. He believed in the "hold-on-to-your-nickles-and-let-the-dollars-fly" plan. There are two sides to most questions. Here are two inky ones.

There was a man who advertised
But once—a single time.
In spot obscure placed he his ad.,
And paid for it a dime.

And just because it didn't bring
Consumers by the score,
"All advertising is a fake,"
He said, or, rather, swore.

He seemed to think one hammer tap
Would drive a nail clear in;
That from a bit of tiny thread
A weaver tents could spin.

If he this reason bright applied
To eating, doubtless he
Would claim one little bite would feed
Ten men a century.

Some day, though, he will learn that to
Make advertising pay
He'll have to add ads to his ad.,
And advertise each day.

I fear I have tired you with a somewhat lengthy article, but will ask your kind indulgence before bringing this paper to a close.

Electric lighting has sharpened the zeal and inventive power of those engaged in the manufacturing and distribution of gas.

Part of our energy in this direction is brought out in the shape of a gas pipe bending machine. (See Wrinkle Department.)

Iron piping does not seem to keep pace with the changes usually expected in general practice, while other departments are improved at every opportunity as competition tightens. It is probable that the inner surfaces of the pipes made to-day are smoother and more uniform than the first pipes that were made.

It appears from the best information we can get that, about the year 1825,

in order to meet the largely increased demand for gas tubing, it became evident that some better mode of manufacturing gas tubes should be employed than the process of welding gun barrels. James and John Russell appreciating the fact, began the making of improved gas tubes. They conceived the idea, and patented it, of welding their tubes by butting the edges together, produced by drawing the iron through a die. Next follows the invention of the socket or coupling. T's, crosses, elbows, etc., were forged to order until the cast and malleable fittings arrived. But what I would like to call your attention to is the need of introducing a system of gas-fitting that shall cause less friction than that in use. I would where possible, do away with all elbow fittings and use bent pipes instead. The socket is bad, the elbow is worse, and the T worse than the elbow. Water, steam or gas will follow a curved course in a pipe of uniform section almost as easy as it will follow a straight pipe, while it always makes strong objections to being driven through the common elbow. The adoption of long radius T's and elbows would be a move in the right direction, and will make further improvement more easy of attainment. Our piping system is practically the victim of mistaken ideas of what constitutes cheapness, perhaps combined with the constitutional disregard of the fitter. The prevailing idea all along has been, not what arrangements would be best for the transmission of gas (if the gas would not actually refuse to flow), anything would be good enough so far as that was concerned, but what would be the cheapest, quickest, and easiest connected if five minutes could be saved in putting up a lot of pipe. No other consideration as to the permanent use of the pipe is noticed.

If you know all about the discounts you know how wonderfully cheap the fittings are, but the system does not produce a wonderfully neat and satisfactory installation. Cheap to put up might be a proper consideration, but to be cheap to operate or maintain should be the chief consideration.

I have illustrated in Figs. 1, 2 and 3 the Y branch and tees, so as to be more fully understood. By introducing this style of fitting to take the place of the common fittings so generally used, and by using bent pipe in place of the common elbow, less friction would be the result. Pipes could be blown out easier when clogged. It insures a better service, is neater looking and costs no more than the old way to introduce. The Durham system of draining in all large buildings is adopted for the same reasons.

Hoping that I have at least entertained you, and at the same time left you ample room for discussion, I will, with the firm belief that gas companies should do their own gasfitting, close

Discussion.

The Secretary—Mr. Parker has gone into this subject with great thoroughness, and we all know, from the Wrinkles which he has given us in other years, how inventive he is. I know when this paper is published it will be a thing for you to study over and save money by.

Mr. Osborne—I believe the use of galvanized fittings is very essential and saves a great deal of money and time. The extra cost of such fittings does not amount to anything compared to the time that you very often consume with common fittings in which sand holes exist. If I were a gasfitter I would use nothing but galvanized fittings in all piping, using all the bends possible.

The President—Regarding the use of galvanized fittings I think ordinary fittings known to be good and tested to be sound will give as good results as the galvanized ones. I suppose Mr. Osborne's idea is that galvanizing would stop up any sandholes in the pipe. I suppose it might stop small ones, but not large ones; and galvanizing might not even stop up the small ones permanently.

Mr. Osborne—The large leaks we can find all the time, but little ones are those that bother us.

Mr. Aldrich—One word in answer to Mr. Osborne with reference to malleable fittings vs. galvanized. I would not advocate using galvanized fittings, for the simple and only reason that if you purchase your fittings of a reliable firm you need have no fear of being troubled with many sandholes. I suppose for a small company we use more malleable fittings than any other two or three companies in the State. Regarding Mr. Parker's able paper and some of its sentiments I find myself making the same remark that Mr. Jones did to Mr. Guldlin, when he said the conditions in the East and the West are so different. Speaking figuratively, I feel myself between the devil and the deep sea. Being at Spokane, I am neither East nor West, in this respect, and I can well imagine that being in San Francisco I must expect to see an electric drop and a gas fixture hanging side by side in a house; but as Mr. Jones says, you have to take conditions as you find them; you cannot make them. The reason we do so much fitting, and why I advocate that where possible gas companies should enter the field of gas fitting, is because under proper management the buildings in course of erection are sure to be properly piped. When I took hold of Spokane it was *infra dig.* for any plumber to pipe a house. Two-thirds of Spokane was not piped. There are 4, 5 and 6-story blocks there without a foot of pipe in them. One of the extraordinary phases of gas supplying, to my mind, and one of the contradictions that take place between theory and practice can be no better exemplified than at Spokane, where I have in some buildings ran up temporarily, to supply one or two stoves, a half-inch riser. In the Eagle Block, on Riverside, a half inch riser supplies no less than 9 gas ranges, and I should be confounded were anyone to speak to me in reference to circulations and distributions and capacities and sizes, etc.; but I only know it as a fact that a half-inch riser supplies 9 gas ranges, and I have never had one complaint of short supplies. To my mind the question of piping is one of locality. If you find that the architects are piping their houses on their plans, I would say by all means don't interfere with them; but where you find the architect just considering the fact of putting up a house at its lowest cost, irrespective of the internal furnishing, then I say it is the duty of every gas man who has the interest of the stockholders at heart, to go after that architect and insist if possible on having him pipe the house properly. That is the reason why Spokane does so much piping. I have at present three men all the time piping houses and buildings. I won't enter into the matter of how this came about, but will say that now the architects, instead of my going after them, bring their plans to my office and I measure up and give a price on the job. As I said before I do 95 per cent. of the gasfitting in the town, and intend to do it as long as we remain in the business.

Mr. Gregory—I would like to ask Mr. Aldrich what the gas pressure is where those 9 gas stoves are supplied.

Mr. Aldrich—Twenty-four tenths.

Mr. Gregory—That is quite high. The opposition in our locality is an electrical opposition. Once in a while in advising the wiring of buildings they advise also that it is not necessary to put in gas pipes, just simply to wire the building, and electricity will be all-sufficient. In my canvassing I did not think it was a good idea to tell the people it was not necessary to wire the buildings and just put in gas pipe. Instead I said it was better to both pipe and wire the building. I thought we were able, as gas men, to go into honest competition, and after they put in both wire and pipe we would be satisfied with the result.

Mr. Clements—I would like to ask Mr. Gregory if the electric light company and the gas company are not one, and that if the user does not take one kind of light or the other.

Mr. Gregory—Well, the opposition and ourselves are not one. We have an electric plant. I did not think at the time though about furnishing our own wiring. It would be very convenient to furnish our own light on the wire, but as I said before I felt that the opposition of gas against electricity, after advising that the wire and pipe both be put in, is suitable to us. We can generally get in. You see I represent the gas side of it entirely, and I feel as though gas can entirely overcome electricity or opposition electricity. I advise the wiring and piping of the buildings, and then we will stand by the result.

Mr. Osborne—I would like to ask if any company here operating a combined plant inspects the wiring. I consider that fully as necessary as gas inspection, and there is more chance for doing poor work in wiring dwellings than there is in piping them.

Mr. Gregory—I believe the city of San Jose employs an electric inspector. I presume he has to inspect all wire in all houses, the city inspector I mean; and sometimes those people are charged with being very sleepy inspectors.

Mr. Steinmann—In Sacramento, where they even wire the trees, we have no inspectors. In my house I have had wiring done three times, and they said they gave me a good job, but if they did I don't know what the other fellows get.

Mr. Hollidge—Referring to the remarks of Mr. Gregory as to the matter of wiring. Providing you own both plants it is all very well, but if you are wiring for the purpose of other people coming in in competition with your gas or Welsbach lamps, you will find this characteristic of the American people throughout the country, wherever they can attach a button and light the whole place up, they will prefer to do so rather than get a Welsbach lamp. Even although the light is insufficient and the illuminating capacity is not in the electric light as it is in the Welsbach lamp, yet, if they can press a button, they will prefer it. You will find it so throughout the world wherever you go; persons will in all probability do as much as they can to avoid as much work as they can. In all cases I find it so, and there is no way for the Welsbach lamps to come into competition with the 16 or 32-candle power incandescent electric lights to-day, unless we can get a cheap automatic device that will enable people by touching a button to light their Welsbach lamps with the same degree of labor that they can light the elec-

tric lamp. Therefore, I say if you wire a building for an opposition plant the opposition will get away with you every time, and I believe if you are wiring a place and running gas only you are cutting your own throat by so doing. I believe in letting the other fellow look after the wiring, while we are looking after our Welsbach lighting. Mr. Aldrich stated that he had a ¾-inch pipe running to and supplying 9 gas cookers. Well, that seems to me rather a small pipe to carry so many stoves. I run a ½-inch pipe direct from the meter to every stove I put in. I use no other method than to run it direct, and I get the best results in supplying a gas stove by connecting it with a large pipe, say ¾-inch; sometimes I use a ¾-inch pipe. How he can get nine stoves off a ¾-inch pipe with 24 10ths pressure I can't imagine. I think he must carry a heavier pressure.

Mr. Steinmann—Spokane is a windy city; full of wind.

Mr. Hollidge—That is a whole lot of gas to come from one pipe for the supply of nine stoves. I think Mr. Aldrich is mistaken about his pressure. He must carry 50-tenths instead of 24-tenths.

Mr. Aldrich—The speaker seems to be under the hallucination that I advocate a ¾-inch pipe for nine gas stoves. I thought I said I had previously run a ¾-inch up one floor to supply two gas stoves, where there was no pipe. Ultimately those two grew into nine stoves, but we had nothing whatever to do with the result. I am not going to pipe owners' blocks for nothing, whatever I may do for the tenants. Originally the pipe was run for two stoves, but ultimately (after Spokane did not succeed in the boom, and offices that were put up had to be made into front parlors for housekeeping) we had to run pipes in all directions. If our brother will ever take the trouble to come to Spokane I will give him a good time and show him these nine stoves. Of course nobody would be foolish enough to advocate anything less than a ¾-inch supply. I have every house so planned. It has a distinct and separate supply from the cellar to the kitchen for a gas stove.

Mr. Parker—In support of the gas man from Spokane, when I went to Napa I found a ¾-inch pipe running 1,000 feet to supply one consumer. Along the line where that house was built a street improvement was going on and our Company saw fit to lay a 3-inch pipe down that street. We had no other connection but that ¾ inch pipe to enter into that 3-inch, simply to test it and keep the consumer going. As the street improvements went on and dwellings began to go up, our business was such that we had not really time to make that connection, and we supplied 12 dwellings out of that 3-inch supply from that ¾-inch pipe which ran 1,000 feet. Our pressure is 18-tenths.

Mr. Osborne—I think a point that should be brought to the attention of stove manufacturers is that a great many times unnecessary labor and pipe fittings are needed to connect a stove—where there is only a connection on the right hand side of the stove, for instance. An opening or two left on the other side of the stove, so we could connect on that side, would very often be a matter of convenience to the fitter in setting up the stove to allow boiling burners. If instead of putting in an ell a tee was placed very often a great deal of pipe and labor would be saved. That plan of supplying gas to 9 stoves from a half-inch pipe should have been contributed to Editor Clements "Experience Department." I have had three meters on one stove, however. It works very well. When the first cook finished her cooking she would turn off the gas, and then another one would come on and do her cooking and turn on her gas, and so on. We might have 9 meters to one stove, but I never saw 9 stoves to 1 meter.

Mr. Aldrich—I did not say 9 stoves to 1 meter. What I said was 9 stoves were connected with ½-inch service. A hall meter and a separate meter were opposite each stove. Now you have it.

Mr. Steinmann—And a bill for each consumer?

Mr. Aldrich—And a bill to each consumer. A house meter which all the consumption of the 9 stoves passed through, and those 9 consumptions are deducted from the meter.

The Secretary—I think it would be well to stop this discussion right here, for if they keep on they will have Mr. Aldrich supplying the whole town of Spokane from a ½-inch holder. There is a matter in connection with Mr. Hollidge's suggestion, as to lighting gas by electricity, that we can look forward to with some pleasure. I think the day is coming when the electric lighting wires that are now in houses for illumination will be used solely for the purpose of lighting the gas fixtures in the houses. The hour of adjournment is now at hand, and I want to say that, at 2 o'clock, when we meet after adjournment, the Wrinkle budget will be taken up. Editor Hollidge has a most interesting lot of them, and they appeal particularly to gas men in affording topics of discussion that often elicit information not afforded by the papers.

The Association adjourned, to reassemble at 2:30 P.M.

[To be Continued.]

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, August 10th, 1898.

Gas in London.—The Workman-Director.—The South Wales Coal Strike.—Dispute about a Gasholder.

The reports and statements of accounts of the London Gas Companies for the half year ended June 30th, 1898, have been issued in the usual course, and on the whole show a satisfactory state of affairs. Notwithstanding the unfavorable nature of the past winter, both as regards consumption of gas, and also coke, the sales of gas have increased. This means that, but for the extraordinary mildness, absence of frost and fog, etc., a substantial advance would have been chronicled. The output of slot meters, together with fittings and stoves in connection with the same, continues in active progress, and it appears that the advance in this line is limited rather by the capabilities of the staff of fitters at the disposal of the gas companies than by satisfaction of the demand. The slot meter department, having developed so rapidly in the space of a few years, will ultimately attain very important proportions, and it would be idle to speculate as to the number that will be in use in 10 years time. A satisfactory feature is that these appliances now appear to be as accurate in working as the ordinary meter, complaints or disputes about them being few and far between. And there is the fortunate circumstance that people who object to part with 10s. in a lump sum to the quarterly collector, will cheerfully pay in 2s. or 3s. per week through the medium of the slot, and that without any of the abuse that so frequently falls to the lot of its human counterpart. There is a substantial rise in the returns for coke, and a significant feature in connection with this item is the increased consumption of petroleum and oil for making water gas, showing that although the receipts have increased, the actual quantity put upon the market is less. Which goes to show that, in populous districts at any rate, the water gas cupola is likely to prove a better friend than the latest novelty in regenerator furnaces, which affects a large saving on the fuel account. The first consideration, before saving more coke for sale, is to make sure of a market that will enable prices to be kept stiff. There is some decrease in respect to tar, which is apparently worth more for fuel or asphalt making than for the extraction of the numerous valuable chemicals that are said to be present in it, and which leads some to believe that tar alone would pay the dividend. Sulphate is greatly improved and likely to continue firm for the present.

The report of the South Metropolitan Gas Company includes full particulars of the workman-director scheme, which has been occupying the attention of Mr. Geo. Livesey for some time, and now only awaits the approval of the shareholders. Workman-directors are not unknown in other branches of industry, but are certainly a novelty to gas undertakings, and therefore it would be ungracious to offer any hostile criticism simply because the thing has never been heard of before. A perusal of the scheme, moreover, renders it evident that the workman-director assumes his office, not as a representative of the workman, but as a representative of the workman's invested capital in the concern, which is a different thing. The expression "Workman-director" rather conveys the idea of the representation of another set of interests at the board. The ordinary director is sometimes supposed to represent the capitalist, whom it is the fashion now-a-days to call "bloated," and the workman-director, the interests of labor. But the scheme is merely an offshoot of the profit sharing, which, to say the least, has not proved a failure, and is a tentative proposal, subject to termination in three years, or at any time when the holding of the employees in the capital of the company may fall below £40,000. So in place of the rough-and-tumble capital and labor arena which might possibly follow the introduction of direct labor interests on the board, the new departure simply means a peaceful assembly of active and sleeping partners. Employees at weekly wages, who are also holders of capital stock, will have a right to elect two, and stockholders also employed at monthly salaries one, making three workman-directors in all, and the fact that they are elected by shareholders, and that their official existence depends upon a certain holding, shows at once that they are elected to look after the holding and not to hold a watching brief in the interests—or what agitators may for their own purposes call the interests—of the wage earners. The qualifications for office are, having been employed by the Company for a minimum of 7 years, and having held for at least 12 months, and continuing to hold, £100 in the stock of the Company. The workman-director will not rank for fees with the ordinary director, but will be subject to a special arrangement that will secure him about half a guinea per attendance, in addition to his regular wage or salary,

so the sweets of office are scarcely worth hungering for, and it is in effect an honorary position.

Mr. Geo. Livesey and his colleagues sell gas cheaply, keep everybody contented and always have a balance on the right side of the profit and loss account. When the main results are so satisfactory, it is rather venturesome to inquire too closely into details. Whatever the outcome may be, it is well known that any new departure at Old Kent Road is the result of careful thinking out, and the progress of this novel and bold experiment will be watched with great interest. One reason for avoiding new schemes is the difficulty of getting rid of them, and if they would come, like the present one, with coffin in hand and all provision for decent interment when desired, gas engineers would not so often exhibit the proverbial hesitancy. After all, these questions of work and wages ought not to be discussed in the spirit of the old miser who would not hesitate to employ Satan himself if he could make 2 per cent. on the transaction, and the workman-director scheme, like its predecessor, the profit sharing one, is to be commended for the "common humanity" sort of flavor that hangs about it.

An obstinate dispute is proceeding in the South Wales coal districts, the men having gathered under one party and made certain demands which the colliery owners or employers, who are also associated, refuse to recognize. The result is that there has been almost a complete cessation of labor for four months, and each party stands aloof, waiting for the other to give in. A pitiable state of things! Wives and children must starve, rather than that the husbands or fathers should endure the humiliation of defeat. Capitalists must sit by and see the trading connection, gradually brought together as the result of years of plodding push, dissolving away, never to return. Some parts of South Wales are already more like portions of the moon's crust than of a habitable globe.

There are acres and acres of slag tips, with ruins of furnaces and workshops that were once hives of industry, but are now neglected and desolate, having been crushed under the competition of places nearer the seaboard. There is something pleasing about wandering amid ancient ruins, but no corresponding feeling in modern ruins. And nothing tends to increase the area of devastation more than these unfortunate disputes. I do not raise this question in a partisan spirit, or pretend to indicate where the fault lies, but merely draw attention to the deplorable consequences. Very few gas coal pits are involved, the bulk being engaged in the production of anthracite or "smokeless" coal. Travellers on the main lines of railway, or visitors to and residents in our principal towns, know well that the substitutes being used do not all come under the "smokeless" category. But it is an ill wind that does not blow right for somebody, and gas companies who have large heaps of coke on hand have been able to considerably reduce the same, and to practically illustrate the truth which a certain shrewd advertiser (of course not connected with any gas company) spread abroad some years ago. Advertisements appeared in most of the leading papers headed "A certain cure for smoky chimneys. No more soot, etc., 30 stamps." And those who forwarded the desired 2s. 6d. received in answer an envelope containing the two words, "Burn coke." The diversion of other classes of coal into the vortex created by the absence of supplies from South Wales has of course had a hardening tendency all round, resulting in a general advance of prices, but for the most part these have only been of a trifling nature, and need not be considered as a factor in the cost of producing gas.

A water company in London has been proceeded against and fined for emission of black smoke from the chimneys of a pumping station, and if this course was taken in every instance there would be thousands of such cases to report, which suggests the reflection as to whether the abatement of the smoke nuisance, concerning which so much has been claimed in London and elsewhere, has really gone much further than the substitution of anthracite for bituminous coal, not a very marked advance. Smokeless fuel is rather a different thing from the prevention of smoke, and a great deal more seems to turn upon the price or the supply of anthracite than is generally supposed. One comfort is, that if anthracite fails, coke and gas are always at hand. And if, as recent experience gives strong reasons for believing, the secret of successful smoke abatement is really smokeless fuel, the outcome will be an increased demand for these agents.

An interesting decision has lately been given at the High Court of Justice relative to the rights of the owner of a row of cottages adjoining a gas works at Hull. The gas company have recently excavated 40 feet deep, constructed a gasholder tank, and erected a gasholder rising over 100 feet high, and 105 feet in diameter. In the course of the excavation they disturbed a bed of silt, leading to subsidences that caused cracks and settlements in the plaintiff's property. It is further objected that houses in the shadow of a 100-foot gasholder are not so much in demand, as was the case before the erection of the appliance. The defence was that the gas company had full legal power authorizing the erection of the gasholder. That there was no negligence—using the word in its legal signification—during construction. And that the structure would not have been proceeded with if the demands for gas had not increased, and therefore that the Company were compelled to erect the holder in order to meet their legal obligation. The Judge held that there was nothing in the special act of the Company that protected them from liability to action for damage or nuisance. The powers granted to them were permissive and not obligatory, and contained no absolute compulsion to injure the plaintiff's property by excavation, or to overshadow it by a holder rising 100 feet high. In respect to the subsidences, which were believed to have ceased, as the tank had been finished for some time and the holder was now complete, a verdict for £340 damages was given. And an injunction was granted, forbidding the holder to be raised above the height of 68 feet on the northern side, which the learned Judge appeared to consider would be a matter of no "real inconvenience" to the Company. So the Gas Company having erected a 3-lift holder, are forbidden to use more than two lifts, and the authority that issues the edict considers the limitation a very small matter. No wonder that gas engineers believe "the Bench" should be made to keep strictly to questions of law. The Company reserve the right to appeal, but the decision is sound. Most special Acts contain a clause to the effect that there is nothing in the powers granted that shall protect the Company from actions for damage or nuisance, and the incorporated company stands just in the same relation to its neighbors as a private individual. All of which should have been duly considered and appreciated before that third-lift was put up.

American Versus Welsh Steam Coal.

The Liverpool (England) *Shipping Gazette* says that the time has come when a word of serious warning ought to be given to those who are leading the Welsh miners into the belief that for the purposes of the steam shipping trade South Wales coal is absolutely indispensable. To this impression must be attributed much of the pertinacity which has characterized the action of the miners in the existing dispute, the men apparently being of the opinion that if they only hold out long enough they are bound to obtain all they want. Smokeless coal, which experts declare to be of a quality not inferior to that of South Wales, is found in enormous quantities in Virginia, as also in other parts of America, and arrangements are now being made to ship this coal from Norfolk, Va., for consumption in British steamers. Several large shipments have indeed already been made to the Cape. Shipments of this coal by steamer are now afloat to the River Plate, the Cape Verde Islands, and other markets hitherto supplied exclusively with Welsh coal; but what is more startling, a steamer cargo of Pocahontas coal from Norfolk will be arriving within the next few days in London.

Inquiries are also in progress for bringing large quantities to Southampton for one of the well-known steamship companies. Pocahontas coal has for many years been exclusively used on all the cruisers built for the American government by the Cramp Shipbuilding and Engineering Company, of Philadelphia. The White Star, Cunard and other lines have long employed Pocahontas coal on their east-bound passages, and this very coal was burned by the "Campania" and "Lucania" on the fastest journeys which have ever yet been made by vessels crossing the Atlantic. Careful analysis shows that the coal coming from the mines of West Virginia contains 86.51 per cent. of carbon, and that it is in calorific power equal to the finest Welsh steam coal.

From the Flat Top and Pocahontas regions, the output in 1892 was less than 5,000 tons; it is now nearly 5,000,000 tons annually. The coal field covers more than 300 square miles, and through the whole of this area of say, 200,000 acres, the valuable seam is believed to extend above water from 8 feet to 12 feet in thickness. Having regard to facilities, for shipment prices, and other conditions, Cardiff coal ought in ordinary circumstances to possess a great advantage in the competition of the world; but it is altogether misleading for anyone to tell the Welsh miners that Welsh colliery owners can command their own prices. As the result of the present strike, considerable trade which formerly went to South Wales ports, has already been diverted into other channels, and we fear that much of this trade may never return. The longer the strike continues, the greater will be the extent of this unfortunate diversion.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. LEWIS R. DUTTON, for some time Superintendent of the West Chester (Pa.) Gas Company, has resigned that position to accept a similar one with the Jenkintown and Cheltenham (Pa.) Gas Company. The fact that his former employers sincerely regretted to see him go is good evidence that he understands his business, and is desirable to those whom he serves. In his broadened field of work in the Philadelphia suburban district in question, wherein the Jenkintown Company will operate, we have no doubt that he will give a good account of his stewardship to his present employers. Mr. Dutton's former position in West Chester will be filled by a brother, Mr. Hayes Dutton.

A FEW days ago a daily newspaper, of Newark, N. J., reported the explosion of two gas stoves, which stoves were in houses in almost opposite sections of the city. The Newark Gas Company investigated the reports, which investigations showed that both explosions were traceable to kerosene oil used in ordinary lamps.

PRESIDENT T. GUILFORD SMITH has publicly admitted that the consolidation of the Peoples Gas Light and Coke Company, at Buffalo, N.Y., with the Buffalo City Gas Company, has been agreed upon. All that remains to be done in the premises is to perfect the details, which perfecting is to all intent and purpose completed.

THE authorities of San Francisco have awarded to the San Francisco Gas and Electric Company a contract "to light with gas and electric lights the entire city and county, for a period of two years, from August 1, 1898." Under the agreement the Company will maintain gas lamps at the rate of 11 cents each per night, the rate on electric account to be 50 cents per lamp per night.

MESSRS. H. H. HYDE and E. A. Hyde, of Saginaw, Mich., have secured control of the Menominee (Mich.) Gas Light and Fuel Company, and will operate the same. Mr. H. H. Hyde has been elected President of the Company, and Mr. E. A. Hyde is its Secretary and Manager.

THE Kerr-Murray Manufacturing Company, of Fort Wayne, Ind., has been awarded the contract for the construction of the gasholders for the Jenkintown and Cheltenham (Pa.) Gas Company. The principal holder is to have an initial capacity of 75,000 cubic feet, and it will be arranged to permit of the future addition of a second section. The purifying boxes of the Company are also being constructed by the Kerr-Murray Company.

MR. C. R. COLLINS, General Manager of the Seattle (Wash.) Gas and Electric Company, in a conversation recently had with a reporter of the Seattle *Times*, respecting the local business outlook, said: "Our business can always be taken as a good index to the business situation, and the increased demand for gas, both in the residence and mercantile sections, is to my mind one of the best practical indications that Seattle has been growing in the last 12 months, and growing fast. In the suburban district alone we have placed over 1,000 meters in the past year, which is a pretty clear indication of the fact that the city is growing, for the suburban district is one where the percentage of oil used is greater than that of gas, and 1,000 additional families consuming gas there means a greater increase to the city's population than appears at first glance. In the business section there has been a remarkable increase in the number of firms trading in the city. So great has been the increased consumption of gas alone that our limit has almost been reached, and we have been compelled to double the capacity of our Jackson street works."

AT a recent meeting of the Select Council of Chester, Pa., an ordinance providing that companies maintaining gas, water and steam heating pipes, mains or conduits shall be obliged to lay the same under the sidewalks of paved streets, brought out a lively discussion. Mr. Greenwood spoke against the ordinance, his objection being largely based on the belief that the rights of the Companies affected would cause the measure to be non-effective. The net result of the debate was the rejection of the ordinance.

MR. W. P. KNOWLES, Superintendent of the Richmond (Va.) City Gas Works, has handed in to Mayor Taylor, a report of the operation of the plant under his charge, which report (the 47th annual) covers the year ended December 31, 1897. From it we learn that the quantity of gas made was 213,391,700 cubic feet, of which 80,392,500 cubic feet was coal gas, and 132,999,200 cubic feet was water gas. The shrinkage chargeable to leakage and condensation was equal to 9½ per cent. of the total make. The total receipts were $186,918.69, and the disbursements amounted to $113,749.03, leaving a balance in favor of the works of $73,169.66. To this should be added the value of 13,310,600 cubic feet of gas used in the public buildings and street lamps. The selling rate is $1 per 1,000. The principal charges on disbursement account were: Pay roll, $57,053.99; oil, $26,973.65; coal, $23,987.93. The receipts for gas were $179,454.08; for coke, tar, etc., $7,330.96. The maximum consumption of gas in any 24 hours was on December 21, when the output was 989,269 cubic feet. The maximum production in any 24 hours also occurred on December 21, when 1,022,700 cubic feet were manufactured. At the date of last report the street mains were returned at 73 miles, 618 feet. During the year 5,985 feet were laid. The total length now in use is, therefore, 74 miles, 1,233 feet. Service pipes were put in for 145 new consumers; 8 street lamps were removed, and 2 were erected; 213 stop cock boxes were either lowered or raised, on account of alterations in grades of streets; and 142 meters were taken from locations in cellars to be placed on the first floors of the places served. During the year the following improvements on the plant were made: A new corrugated iron roof was put on the retort house; a new valve was placed on the 16-inch main; new boxes and chutes for conveyors in the purifying house were erected, and 7 benches of 6's were renewed. In the water gas plant new blast valves were put on the generators and superheaters and new fire doors were placed. The steel flooring was extended over the engine room, a new oil heater and oil meter were installed, and new 8-inch seals were put on the old purifying boxes. The new purifying house was painted. In concluding his presentation Superintendent Knowles remarks: "At the upper works a new culvert was run, and the gasholders and all the buildings were painted. I most respectfully renew my recommendation for a new storage holder of 1,000,000 cubic feet capacity, to be located at some convenient point contiguous to main feeder. It is gratifying to be able to report the works in good condition and that they have been conducted with the strictest economy. In conclusion it gives me pleasure to state that the officers and employees have attended to their respective duties faithfully and diligently."

IN further mention of Superintendent Knowles' report it might be said that 6,771 meters are in use in Richmond, and that the average illuminating value of the gas supplied was 21.17 candles. The range was 18.61 candles, in August, and 23.78 candles in December.

MESSRS. JAS. R. and William B. Thompson, of the Thompson Investment Company, of Butte, Mont., and J. J. Coleman, have been granted a franchise for the operation of a gas works in Livingston, Mont. As we understand it a coal gas plant will be built, the coal supply to come from a mine (it is situated at a point about 3 miles distant from Livingston) owned and operated by Mr. Coleman.

AT a meeting of the new owners of the Williamsport (Pa.) Gas Company the following officers were chosen: Directors, H. C. McCormick, Alex. Beede, John F. Laedlin, Chas. K. Geddes, John M. Dean and John G. Reading, of Williamsport, and J. S. Male, of New York; President, H. C. McCormick.

MR. PETER PRIMEAU, of Marquette, Mich., is proposing a scheme for the establishment of a gas works at Sault Sainte Marie, Mich. He asks for a franchise to live for 30 years, and agrees to construct a plant that will mean the investment of $50,000. The place named is the capital of Chippewa county, Mich., and it is located on St. Mary's river, at a point 150 miles east of Marquette. Although the "Soo" has advanced rapidly in importance in the past 10 years, it looks to us that its magnitude now is not of an order equal to the profitable maintaining of a gas works, even admitting that its population is "not far from 5,000."

DURING the season several thousand dollars have been expended in bettering the physical condition of the manufacturing and distributing plants of the Butte City (Mont.) Gas Light and Coke Company. This property is still controlled by the Messrs. Hopper, of Philadelphia, who are quite well satisfied with their investment therein.

THE Madison (Wis.) Gas and Electric Light Company has been awarded a contract for the public lighting by electricity of that place for a term of 5 years. The rates agreed on are: $80 per annum for all-night arc lamps, the rate on midnight arcs to be $60 per annum.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

MONDAY, AUG. 29, 1898.

The Market for Gas Securities.

The manifestation of financiering made this week by the manipulators of Consolidated Gas was quite successful. Several good short lines were put out well above 190, and they were covered in below 187. To-day (Friday) the stock was quoted after noon at 191, which price includes the regular quarterly dividend of 2 per cent., payable the 15th prox. Transfer books close at 3 P.M. of the 31st inst. Many "beautiful reasons" for the decline have been put forward, but the chief cause put out is that open competition for business between the Amsterdam and Consolidated is underway. The most amusing thing about such declaration is that, while Consolidated broke 10 points, Amsterdam common didn't break at all. We rather think that official "short lines" caused the slump, and our advice to holders is to keep their stock. There was a slightly easier feeling in Standards and Mutual.

Brooklyn Union is quoted to-day at 124, a loss for the week of about four points. Peoples, of Chicago, is strong, at 104½ to 104¾. The short interest in this stock is not yet entirely reduced. Baltimore Consolidated is 65½ to 66, and Bay State is well under the fourth mark. Syracuse gas is dull and weak. Buffalo gas shows no change, and United Gas Improvement Company is 238 bid.

Gas Stocks.

Quotations by Frederic H. Cochran & Co., Brokers and Dealers in Gas Stocks.

20 AND 22 BROAD STREET, NEW YORK CITY.

AUG. 29.

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	191	191¼
Cental Union, Bonds, 5's	3,000,000	1,000	104	105
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	..	335
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co.	13,000,000	100	30	30½
Preferred	10,000,000	100	69½	70½
Bonds, 5's	11,000,000	1,000	102	102½
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000	..	107½	108½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	143	145
Preferred	5,000,000	100	163	170
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	124¼	124½
" " Bonds (5's)	15 000,000	1,000	115	115½
Bay State	50,000,000	50	3½	3⅝
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	..
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	23	24
" " Bonds, 5's	5,250,000	1,000	95½	96½
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	89	91
1st Mortgage	1,207,000	1,000	101	103½
Consumers. Jersey City	2,000,000	100	78	85
" Bonds	600,000	1,000	101½	103½
Cincinnati G. & C. Co.	8,500,000	100	203⅞	204
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	65½	66
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	..
Consolidated Gas Co. of N.J.	1,000,000	100	16	21
" Con. Mtg. 5's	380,000	1,000	75	80
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,500,000	50	61	..
" Prior Lien 5's	4,538,000	1,000	94¼	94½
Detroit Gas Co., 5's	428,000	1,000	..	..
" Inc. 5's	34,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	75	80
" Bonds	2,000,000	..	88	9
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jackson Gas Co	250,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	78	83
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	53	54
Preferred	2,500,000	100	96¼	96½
Bonds	10,000,000	1,000	105	105¼
Madison Gas & Elec. Co.	400,000	100	..	..
" 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	52	53
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	104½	104¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	85⅝	86
St. Paul Gas Light Co.	1,500,000	100	49	51
1st Mortgage 6's	650,000	1,000	84	87
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	16½	17½
Bonds	1,500,000	1,000	94	97
Washington, D. C	2,000,000	20	220	..
Western, Milwaukee	4,000,000	100	85½	86
Bonds, 5's	3,556,000	.	101¾	102¼
Wilmington, Del.	550,000		204	206

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DIVIDEND NOTICE.

OFFICE OF WELSBACH COMMERCIAL COMPANY, 40 WALL ST., NEW YORK CITY, Aug. 11, 1898.

The Directors have this day declared a quarterly dividend of two (2) per cent. on the preferred stock, payable Sept. 9, 1898, to stockholders of record at the close of business Aug. 31, 1898. Transfer books of the preferred stock will be closed from Sept. 1 to Sept. 9, 1898, both inclusive. Checks will be mailed

1211-3 EDWARD C. LEE, Treasurer.

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1212-1

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A thoroughly reliable and competent young man wishes to engage as Superintendent of a gas plant (coal gas preferred). Can furnish reference.

Address "No. 9," Care this Journal.

1212-2

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A Position with a Gas Company.

By a young man thoroughly competent in the office and experienced and successful in selling stoves and getting new business generally. Good recommendation from present employers and good reason for wanting a change.

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Position Wanted.

A young, active engineer wants the management of a gas property, or a position under an older man at a large works.

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Address DR. MOSS,

1178-tf Care this Journal.

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A Small Gas and Electric Light Plant,

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Hydraulic, Dip, Branch and Ascension Pipes, Mouthpieces and Lids, for four Benches of 5's and for one Bench of 3 retorts.

Two Coolers, or Air Condensers, each of 150'000 cubic feet capacity.

Multitubular Condenser, shell, 36 in. diameter, with 98 2-in. tubes, 10 ft. 6 in. long.

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Values Ascertained, and Advice as to Management.

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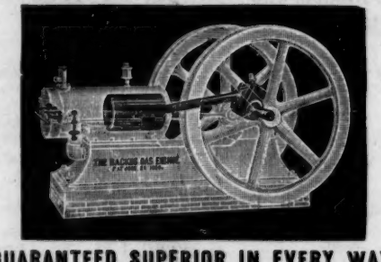

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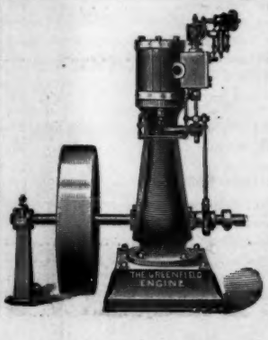

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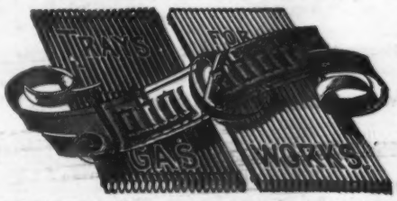

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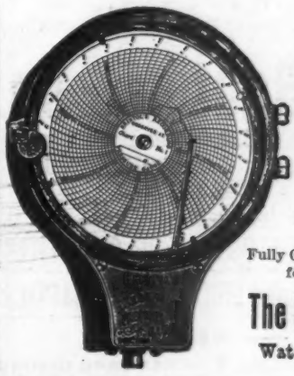

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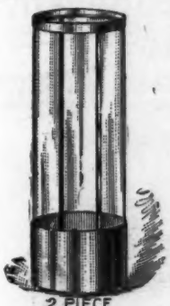

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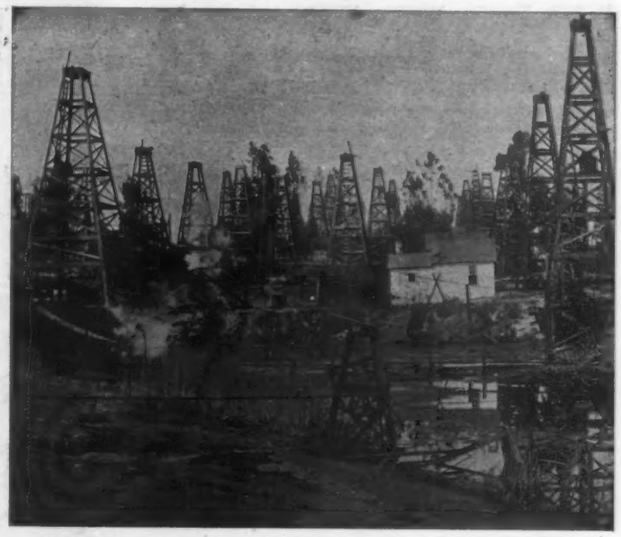
The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.



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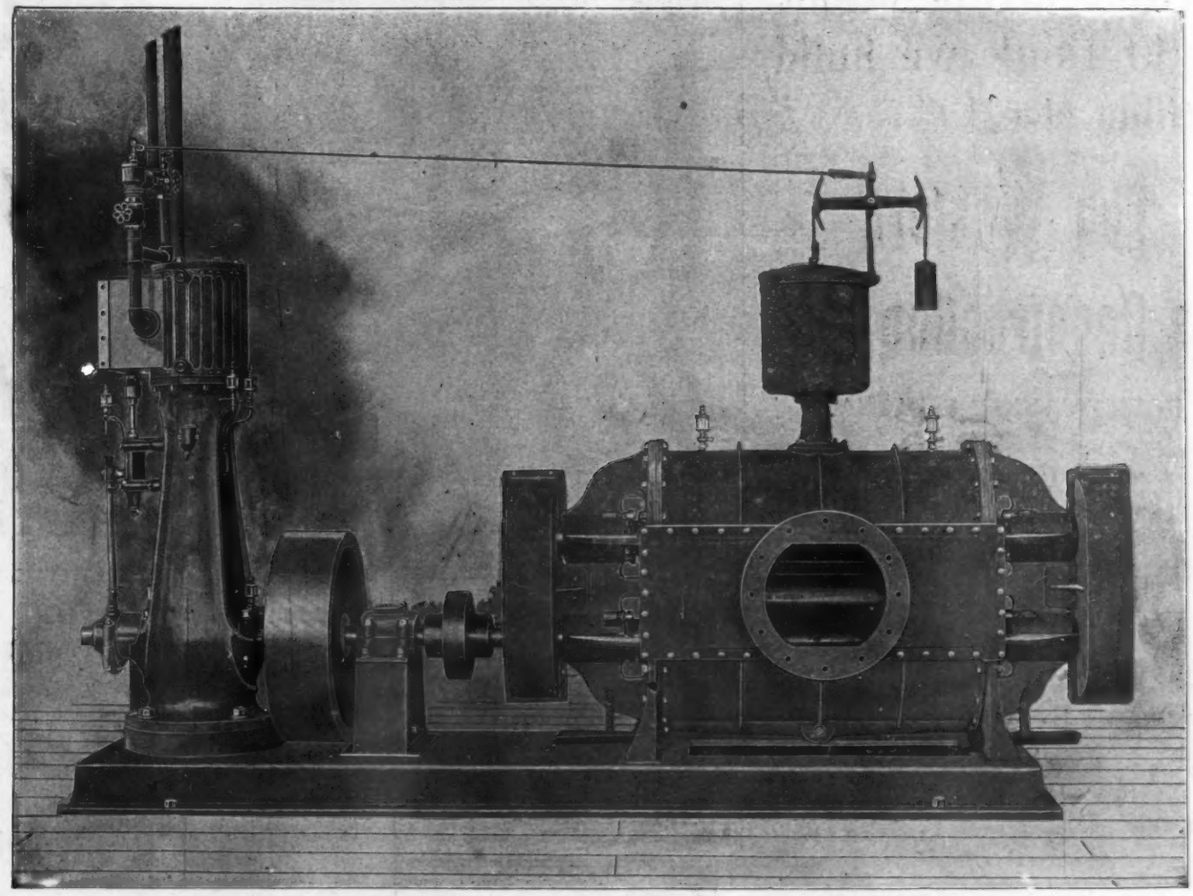

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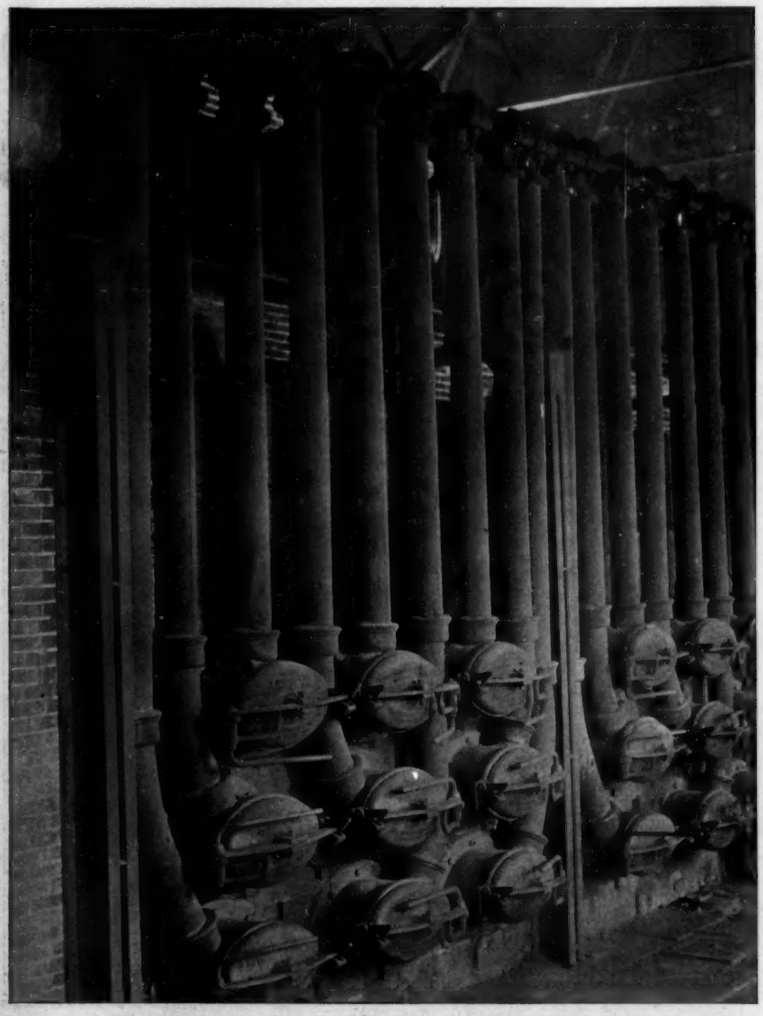

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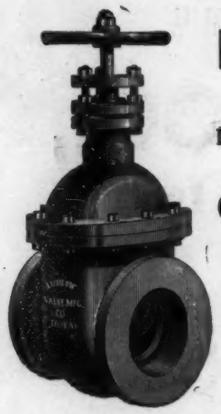

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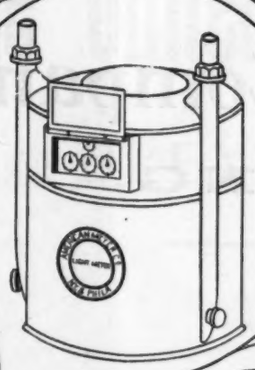
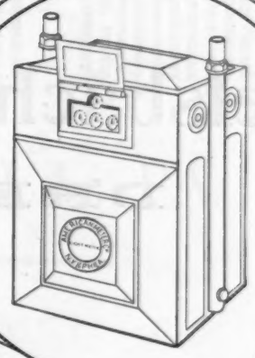
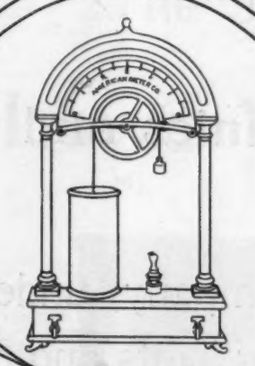


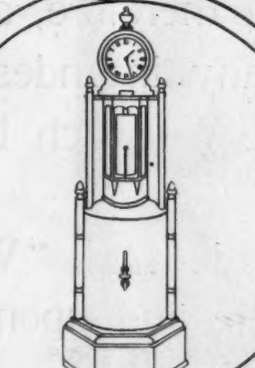


PUBLIC LIGHTING TABLE.

SEPTEMBER, 1898.

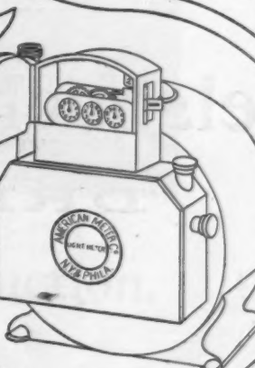
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	No L.	No L.	6.30	4.20
Fri.	2	7.00 PM	8.20 PM	6.30	4.20
Sat.	3	7.00	8.50	6.15	4.30
Sun.	4	6.50	9.20	6.15	4.30
Mon.	5	6.50	9.50	6.15	4 30
Tue.	6	6.50	10.30	6.15	4.30
Wed.	7	6.50 LQ	11.20	6.15	4.30
Thu.	8	6.50	12.10 AM	6.15	4.30
Fri.	9	6.50	1.10	6.15	4.30
Sat.	10	6.50	2.10	6.05	4.40
Sun.	11	6.40	3.10	6.05	4.40
Mon.	12	6.40	4.40	6.05	4.40
Tue.	13	6.40	4.40	6.05	4.40
Wed.	14	6.40	4.40	6.05	4.40
Thu.	15	6.40 NM	4.40	6.05	4.40
Fri.	16	6.40	4.40	6.05	4.40
Sat.	17	6.40	4.40	5.55	4.50
Sun.	18	6.30	4.50	5.55	4.50
Mon.	19	6.30	4.50	5.55	4.50
Tue.	20	7.30	4.50	5.55	4.50
Wed.	21	8.20	4.50	5.55	4.50
Thu.	22	9.20 FQ	4.50	5.55	4.50
Fri.	23	10.30	4.50	5.55	4.50
Sat.	24	11.40	4.50	5.40	5.00
Sun.	25	1.00 AM	4.50	5.40	5.00
Mon.	26	2.10	4.50	5.40	5.00
Tue.	27	3.20	4.50	5.40	5.00
Wed.	28	No L.	No L.	5.40	5.00
Thu.	29	No L. FM	No L.	5.40	5.00
Fri.	30	No L.	No L.	5.40	5.00





TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45



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DREXEL BUILDING,

PHILADELPHIA.

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Correspondence from Gas Companies and the trade generally is solicited.

Suits brought by the Welsbach Light Company, under its patents, against the manufacturers of infringing lights and mantles, are still pending and undetermined. We, therefore, again caution the public against the purchase of any incandescent mantle other than that made and sold by the Welsbach Light Company or its agents.

Every genuine Welsbach lamp has the trade-mark "Welsbach" conspicuously printed upon the package and upon the burner itself.

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The United Gas Improvement Company,

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LOWE WATER GAS APPARATUS.

Total Built and under Construction,

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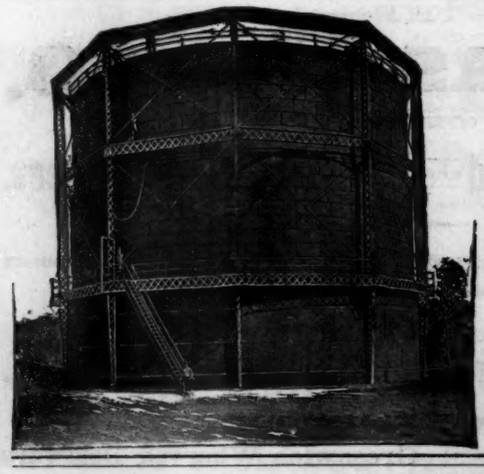

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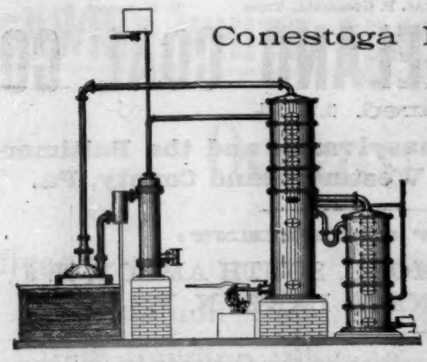

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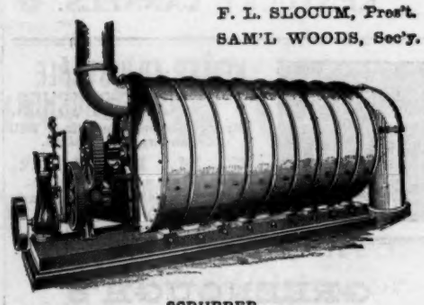

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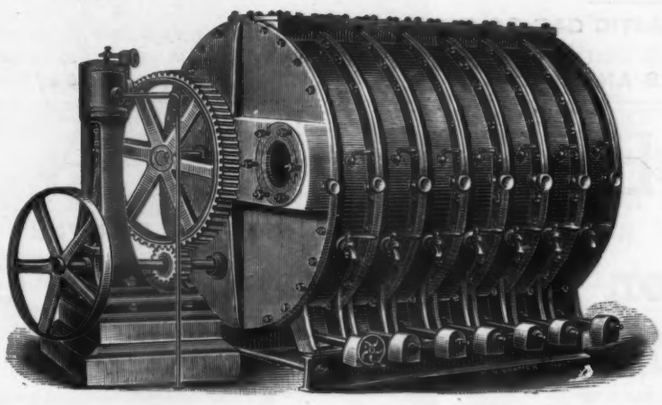

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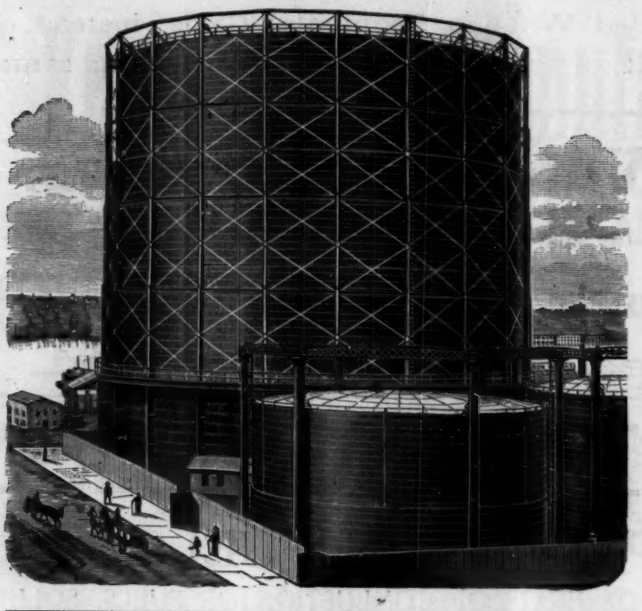

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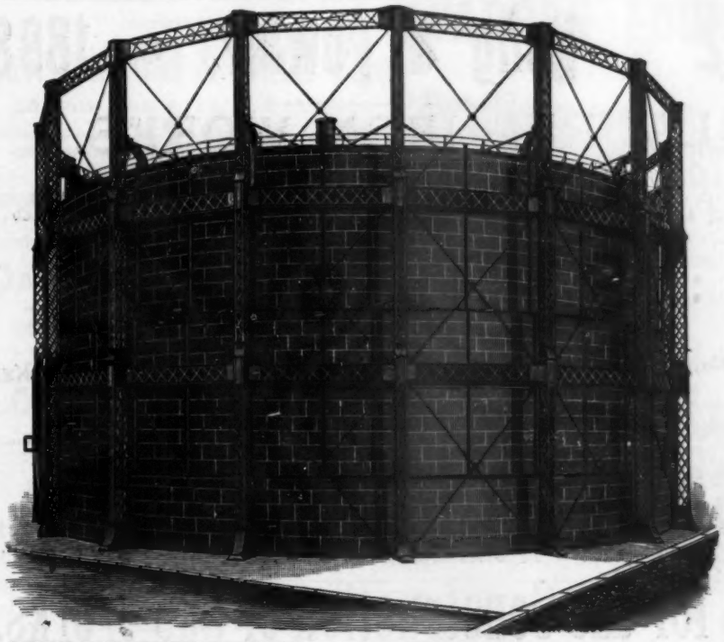

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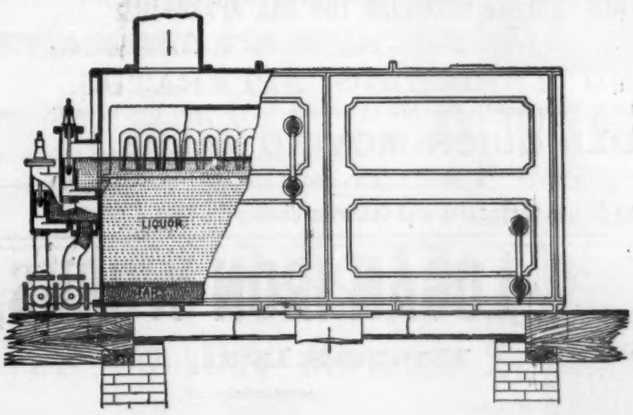

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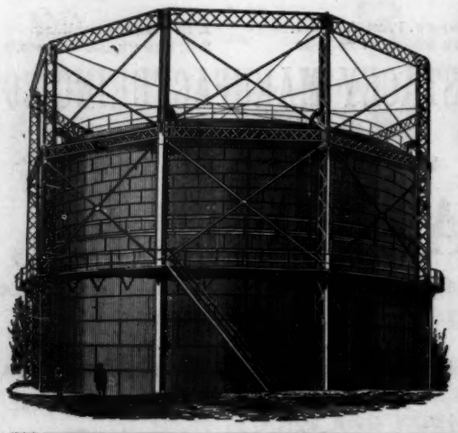

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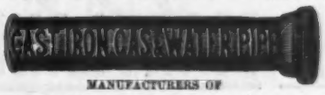

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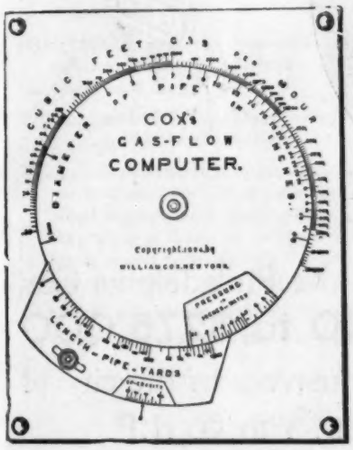

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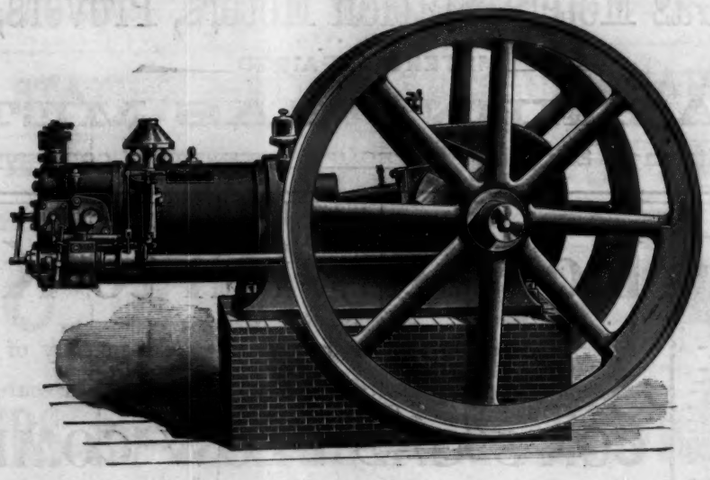

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